

CHAPTER 3

MAINTENANCE INSTRUCTIONS

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Section I. LUBRICATION INSTRUCTIONS

Section Index

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3-1 GENERAL

NOTE

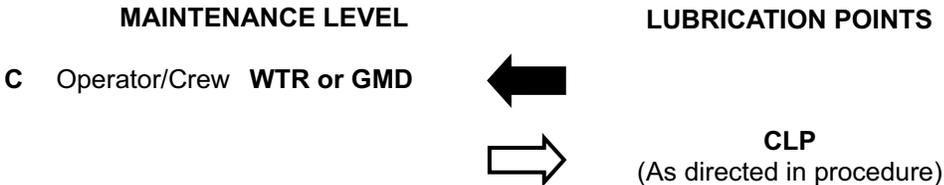
Lubrication instructions in this section are mandatory.

a. Intervals based on normal operations. You should lube more during constant use and lube less during inactive periods. Relubricate after washing, fording (fresh or salt water) or contact with saltwater spray. Clean fittings before lubricating. Clean parts with cleaning compound. Dry before lubricating. DO NOT over lubricate; wipe off excess lubricant.

b. Dotted lines indicate lubrication points on both sides of the equipment. The level of maintenance responsible for each lube instruction is shown, and this section is divided into three sections based on lubrication intervals (DAILY, WEEKLY, and MONTHLY). An overall view showing lubrication points precedes each set of detailed notes for each interval.

c. Daily lubing means once each day after howitzer has been fired.

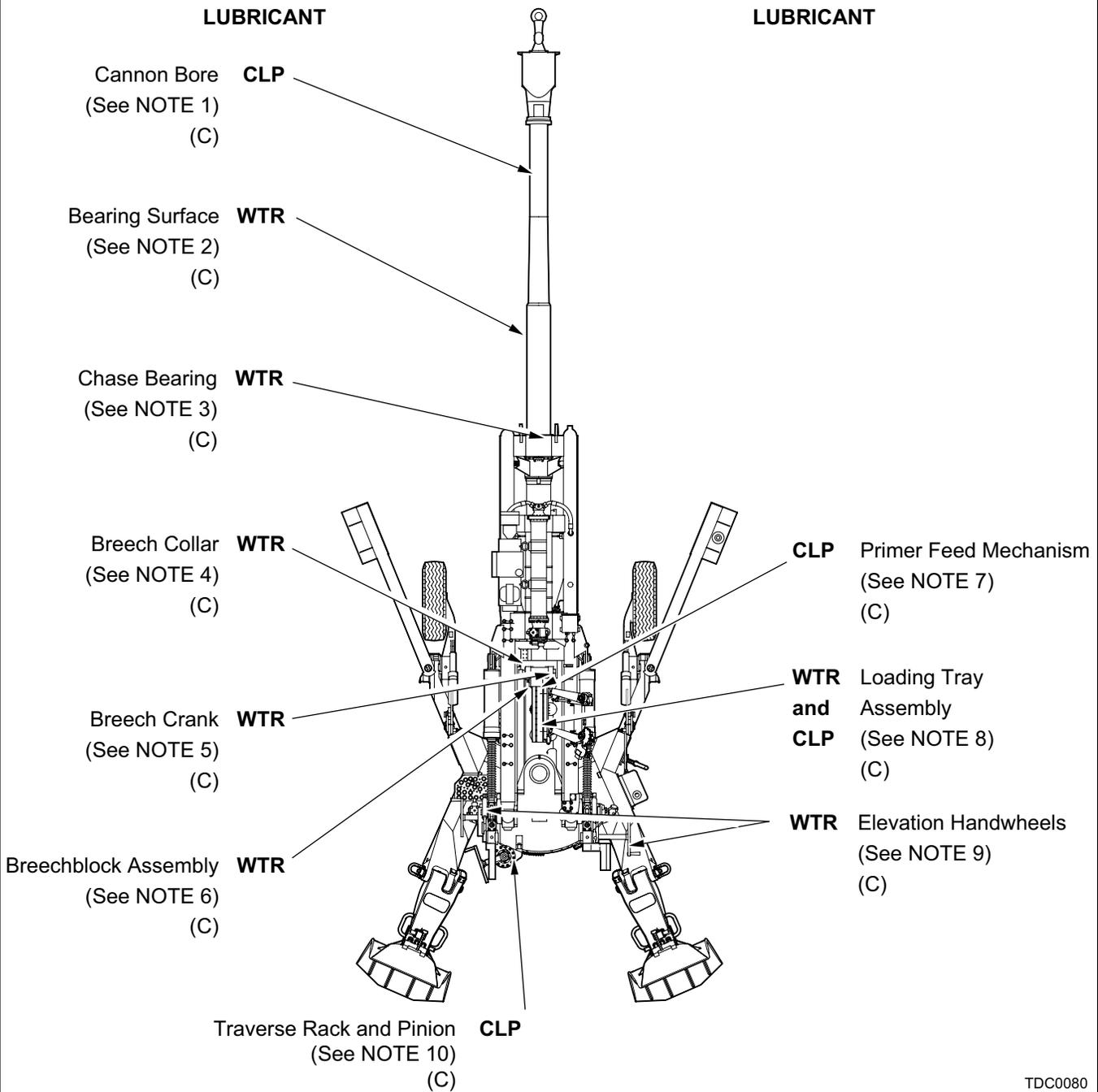
KEY



TDC0079

- CLP** Cleaner, Lubricant and Preservative, MIL-L-63460.
- WTR** Grease, Aircraft, General Purpose, Wide Temperature Range, MIL-G-81322.
- GMD** Grease Molybdenum Disulphide, MIL-G-21164.

DAILY



TDC0080

LAW Lubricant, All Weather, MIL-L-14107 (Only to be used in sub-zero temperatures).

DAILY NOTES

NOTE 1

CANNON BORE (C)

ON DAY OF FIRING

NOTES

The new nylon bore brush is flexible enough that a scrubbing action (back and forth motion) can be used to clean the cannon tube. Work on short sections of the cannon tube (approx 2 ft (0.6m)) starting at the muzzle and working toward the breech.

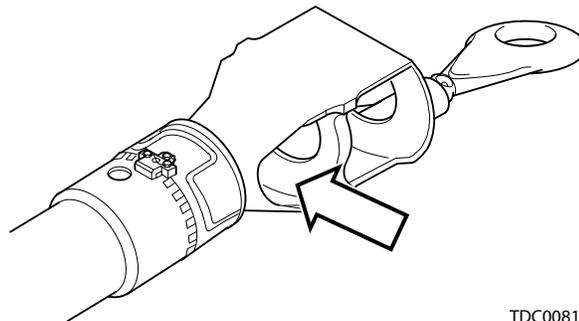
For non-firing periods, the cannon tube and breech mechanism are cleaned and lubricated on a weekly basis.

Attach bore brush assembly to cleaning staff sections. Inspect breech and cannon tube and clear obstructions.

Apply CLP (item 7, appx D) to bore brush and thoroughly wet punch cannon bore three times. Wrap clean wiping rags (item 29, appx D) around bore brush and dry punch the bore twice. Wrap clean wiping rags (item 29, appx D) around bore brush, soak with CLP (item 7, appx D), and punch bore one time.

ON DAY AFTER FIRING

Wrap bore brush with clean wiping rags (item 29, appx D) and dry punch tube once back and once forward. Wrap bore brush with clean wiping rags (item 29, appx D) and apply CLP (item 7, appx D) and wet punch the entire tube once back and once forward. Repeat last step with more CLP (item 7, appx D).



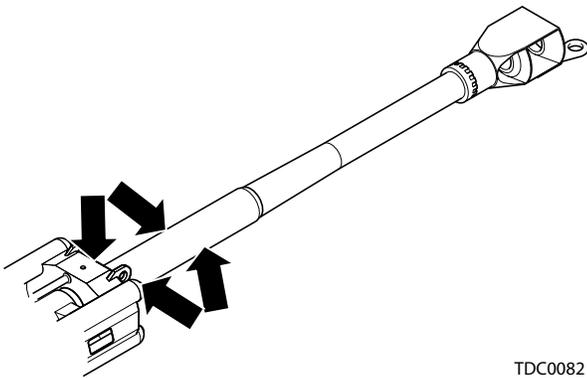
TDC0081

DAILY NOTES (cont)

NOTE 2

BEARING SURFACE (C)

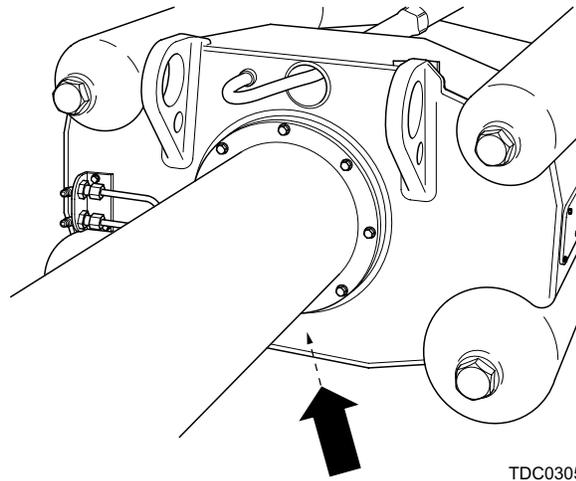
Wipe bearing surface with a clean wiping rag (item 29, appx D).



TDC0082

NOTE 3

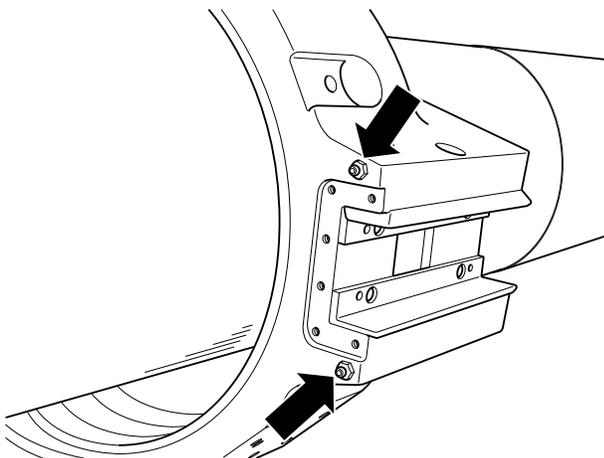
CHASE BEARING (C)



TDC0305

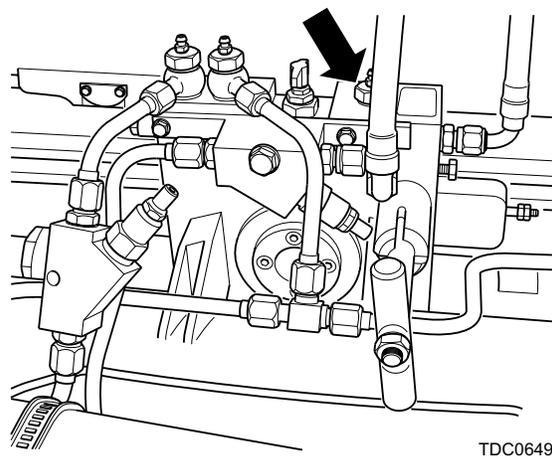
NOTE 4

BREECH COLLAR (C)



NOTE 5

BREECH CRANK (C)



TDC0649

DAILY NOTES (cont)

NOTE 6

BREECHBLOCK ASSEMBLY (C)

BEFORE FIRING

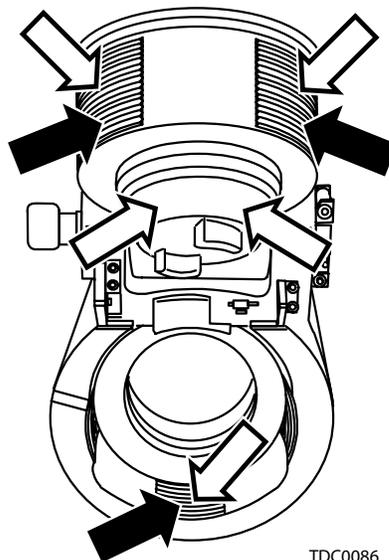
Clean breechblock assembly with CLP (item 7, appx D) and a crocus cloth (item 11, appx D); wipe off excess CLP with a clean wiping rag (item 29, appx D). Apply a light coat of WTR (item 16/17, appx D) to breechblock threads.

AFTER FIRING

Clean breechblock assembly with CLP (item 7, appx D), and wipe dry with a clean wiping rag (item 29, appx D). Apply WTR (item 16/17, appx D) to threads of breechblock and breechring assemblies.

Clean spindle with CLP (item 7, appx D) and a crocus cloth (item 11, appx D); wipe off excess CLP with a clean wiping rag (item 29, appx D).

Clean obturator pad with pad scouring (item 22, appx D) and clean water, wipe with a clean wiping rag (item 29, appx D).



DAILY NOTES (cont)

NOTE 7

PRIMER FEED MECHANISM (C)

TRAY and BODY ASSEMBLIES

AFTER FIRING

Remove the PFM and breech components in the following order:

- M54 Firing mechanism (Para 3-7a).
- Injector arm assembly (Para 3-7c).
- Firing Pin (Para 3-7d).
- Tray assembly (Para 3-7e).
- Body assembly (Para 3-7f).
- Spindle assembly (Para 3-7g).
- Separating breechblock and Carrier assemblies (Para 3-7h).

Service and inspect PFM and breech by, applying CLP (item 7, appx D) to the PFM and breech components. Let soak for 15 minutes and wipe dry with clean dry rags (item 29, appx D). Apply a light coat of CLP (item 7, appx D) to all components.

Install the breech and PFM in the following order:

- Separating breechblock and Carrier assemblies (Para 3-7h).
- Spindle assembly (Para 3-7g).
- Body assembly (Para 3-7i).
- Tray assembly (Para 3-7j).
- Injector arm assembly (Para 3-7k).
- M54 Firing mechanism assembly (Para 3-7l).

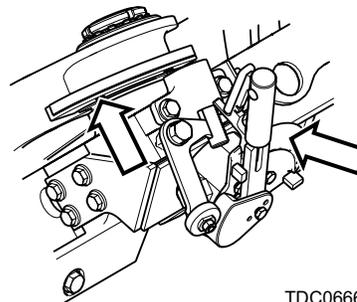
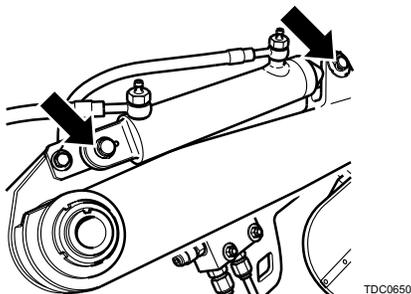
Clean tray and body assemblies with CLP (item 7, appx D), and wipe dry with a clean dry rag (item 29, appx D).

NOTE 8

LOADING TRAY ASSEMBLY (C)

DAY AFTER FIRING

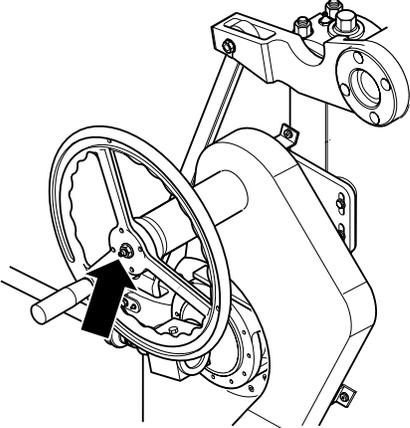
Clean loading tray inter lock plunger with CLP (item 7, appx D) and crocus cloth (item 11, appx D) and wipe dry with clean wiping rag (item 29, appx D).



DAILY NOTES (cont)

NOTE 9

ELEVATION HANDWHEELS (C)



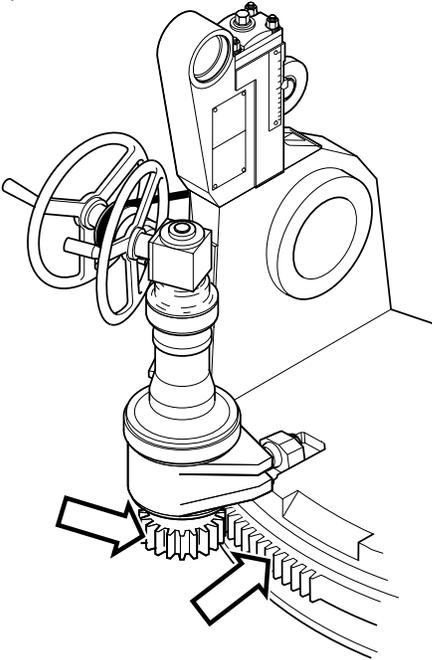
TDC0219

NOTE 10

TRAVERSE RACK AND PINION (C)

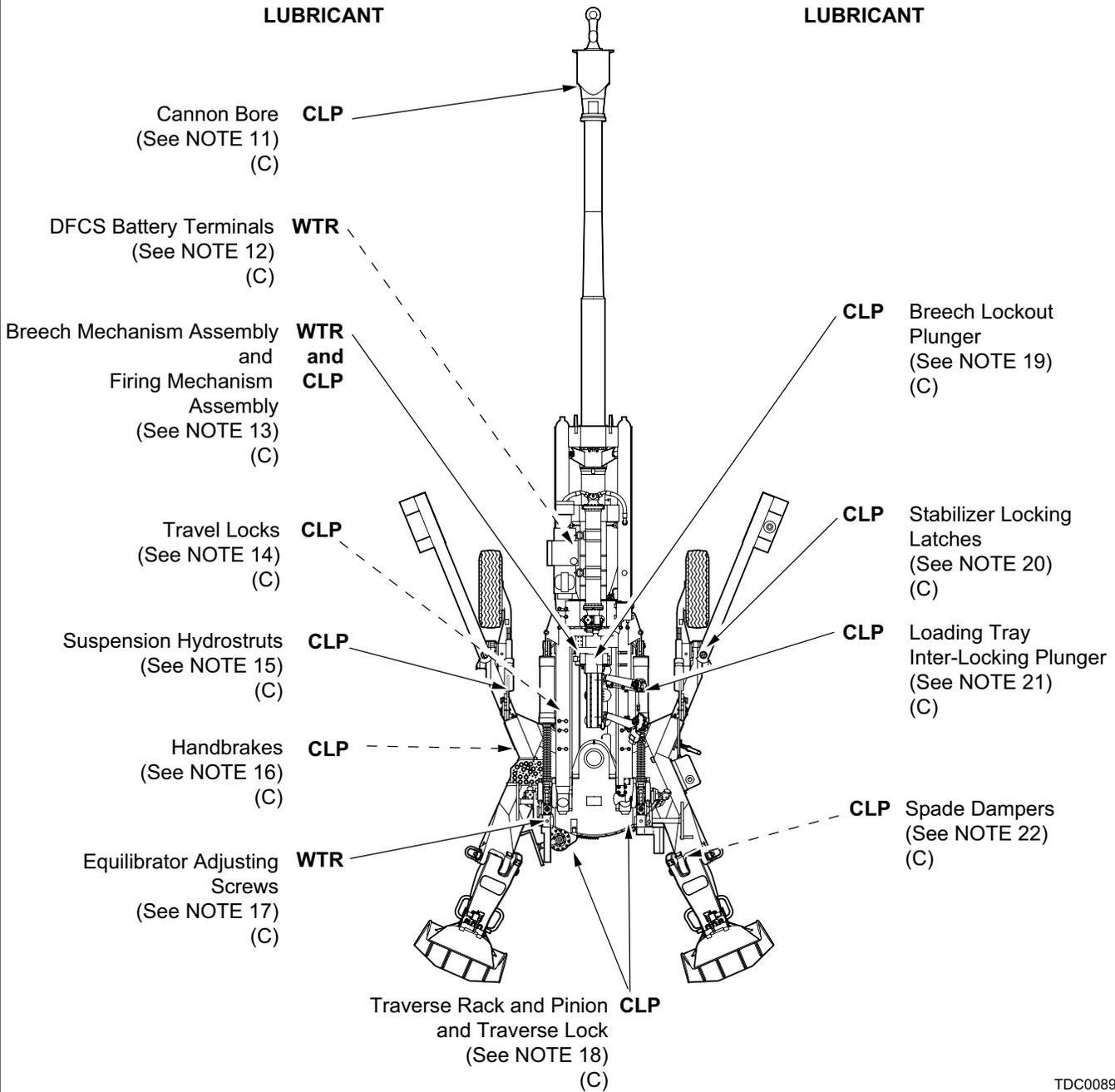
BEFORE/AFTER FIRING

Clean traverse rack and pinion with CLP (item 7, appx D) and crocus cloth (item 11, appx D); wipe dry with a clean wiping rag (item 29, appx D).



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WEEKLY



TDC0089

WEEKLY NOTES

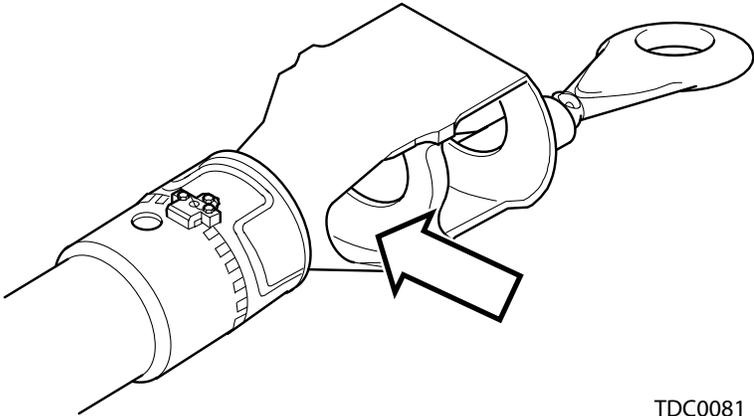
NOTE 11

CANNON BORE (C)

When weapon is not being fired, clean cannon bore with CLP (item 7, appx D), wipe dry with clean wiping rag (item 29, appx D), recoil with CLP (item 7, appx D), and install muzzle plug.

OR

Inspect cannon bore and bearing surface for cleanliness and corrosion. If required, dry punch bore with clean wiping rag (item 29, appx D), then wet punch bore with clean wiping rags (item 29, appx D) soaked with CLP (item 7, appx D).



NOTE 12

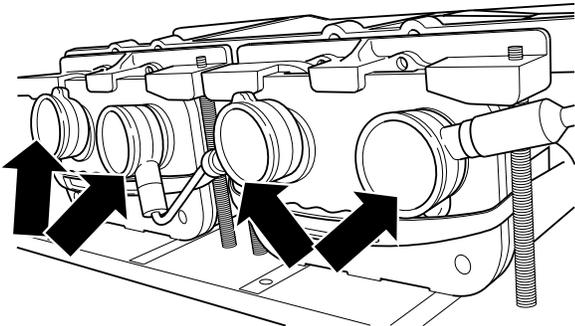
DFCS BATTERIES (BAT) (C)



WARNING
Read and follow all warnings in WARNING SUMMARY.
Pay careful attention to those about batteries.



Remove BAT terminal covers; inspect terminals for cleanliness and corrosion. If required clean and wipe dry terminals with clean wiping rag (item 29, appx D). Apply WTR (item 16/17, appx D) to terminals and install covers.



WEEKLY NOTES (cont)

NOTE 13

**BREECH MECHANISM ASSEMBLY (C)
and FIRING MECHANISM ASSEMBLY(C)**

Remove, disassemble, service/ inspect, assemble and install magazine assembly (Para 3-8).

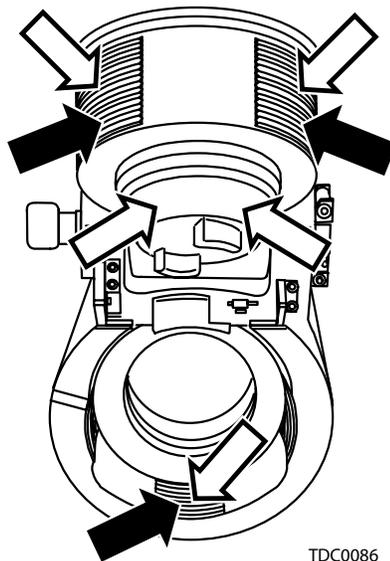
Remove, disassemble, service/ inspect, assemble and install firing mechanism (Paras 3-7a. and l.).

Remove, service/ inspect, and install injector arm assembly (Paras 3-7c. and k.).

Remove, disassemble, service/ inspect, assemble and install firing pin (Para 3-7d.).

Remove, disassemble, service/inspect, assemble and install PFM body and tray assemblies (Paras 3-7 e. and f. and i. and j.) from breech carrier, clean with CLP (item 7, appx D), and wipe dry with a clean wiping rag (item 29, appx D).

Clean breech mechanism assembly with CLP (item 7, appx D), and wipe dry with clean wiping rag (item 29, appx D). Apply WTR (item 16/17, appx D) to threads of breechblock and breechring assemblies.

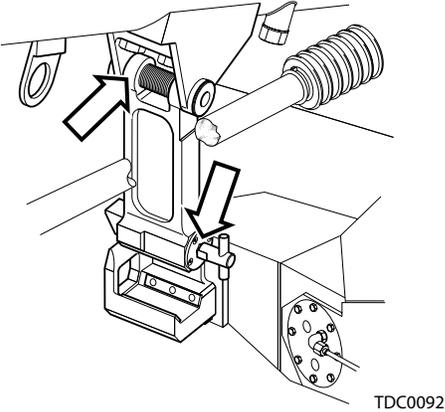


WEEKLY NOTES (cont)

NOTE 14

TRAVEL LOCKS (C)

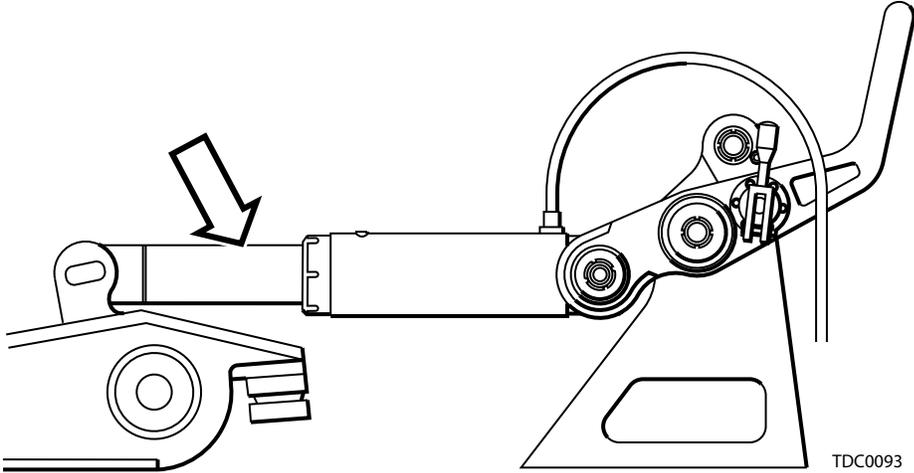
Clean and lubricate travel locks with CLP (item 7, appx D); wipe off excess CLP with a clean wiping rag (item 29, appx D).



NOTE 15

SUSPENSION HYDROSTRUTS (C)

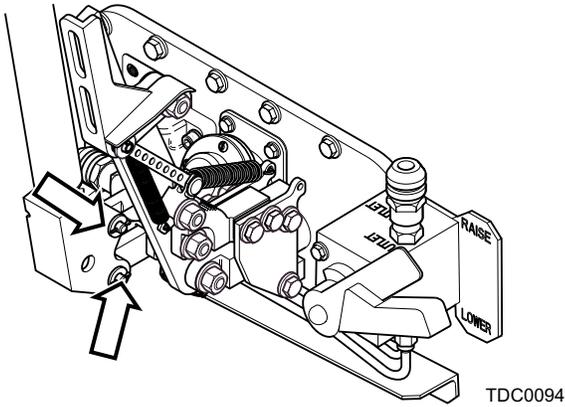
Clean and lubricate suspension hydrostruts with CLP (item 7, appx D); wipe off excess CLP with a clean wiping rag (item 29, appx D).



WEEKLY NOTES (cont)

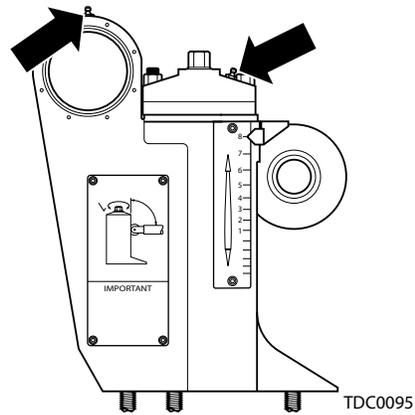
NOTE 16

HANDBRAKES (C)



NOTE 17

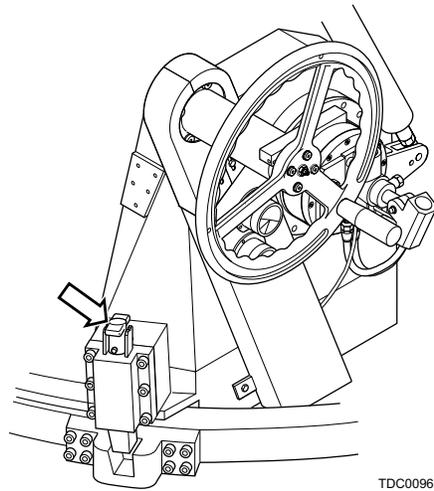
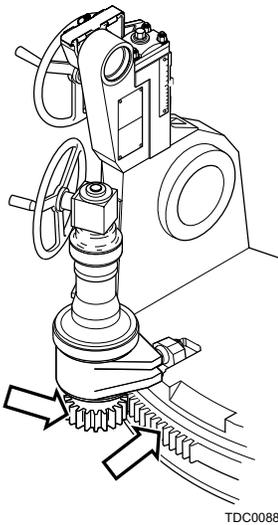
EQUILIBRATOR ADJUSTING SCREWS (C)



NOTE 18

TRAVERSE RACK AND PINION AND TRAVERSE LOCK(C)

Clean traverse rack and pinion with CLP (item 7, appx D) and a crocus cloth (item 11, appx D); wipe dry with a clean wiping rag (item 29, appx D).

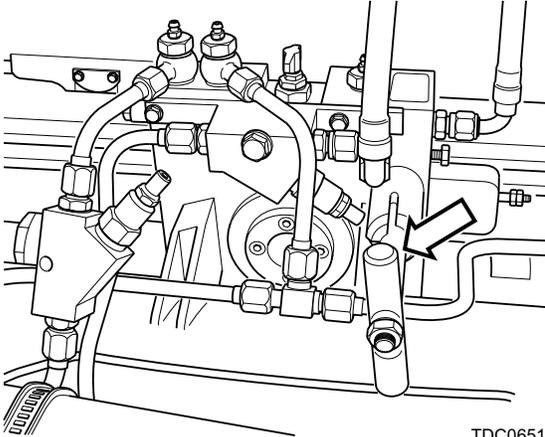


WEEKLY NOTES (cont)

NOTE 19

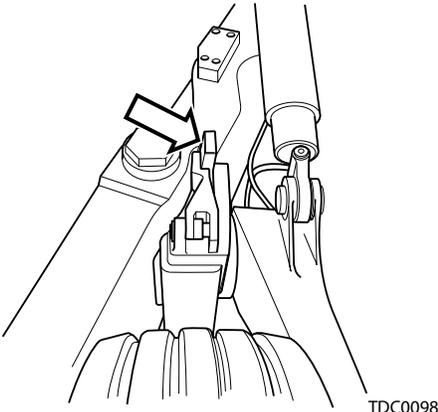
BREECH LOCK-OUT PLUNGER (C)

Wipe clean with a clean wiping rag (item 29, appx D).



NOTE 20

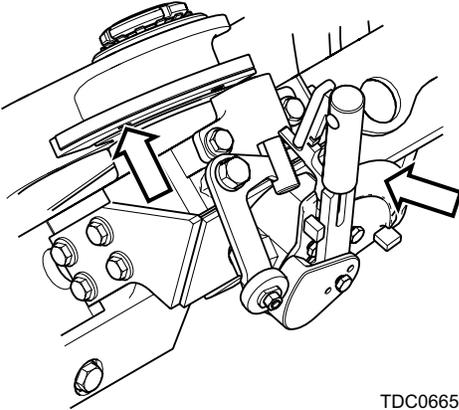
STABILIZER LOCKING LATCHES (C)



NOTE 21

LOADING TRAY INTER-LOCK PLUNGER (C)

Clean loading tray interlock plunger with CLP (item 7, appx D) and crocus cloth (item 11, appx D) and wipe dry with clean wiping rag (item 29, appx D).



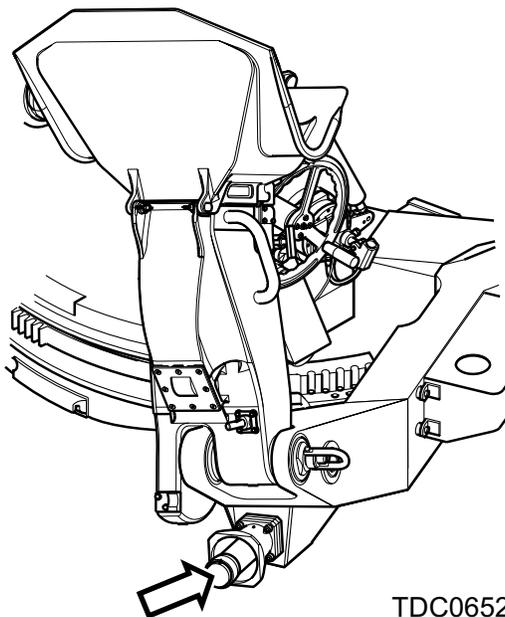
WEEKLY NOTES (cont)

NOTE 22

SPADE DAMPERS (C)

Clean spade dampers with CLP (item 7, appx D) and a crocus cloth (item 11, appx D); wipe off excess CLP with a clean wiping rag (item 29, appx D).

Clean button head with CLP (item 7, appx D) and a crocus cloth (item 11, appx D); wipe off excess CLP with a clean wiping rag (item 29, appx D).



TDC0652

MONTHLY

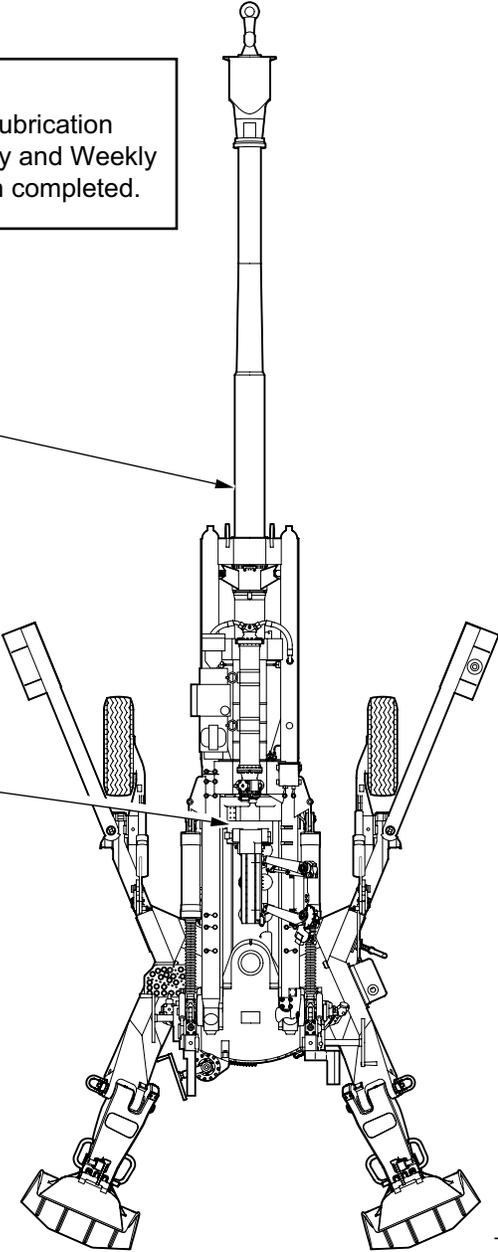
LUBRICANT

LUBRICANT

NOTE
When performing Monthly lubrication instructions, ensure all Daily and Weekly lubrication steps have been completed.

Cannon Tube
(See NOTE 23)
(C) **WTR and CLP**

Breech Mechanism
Assembly
(See NOTE 24)
(C) **WTR**



TDC0102

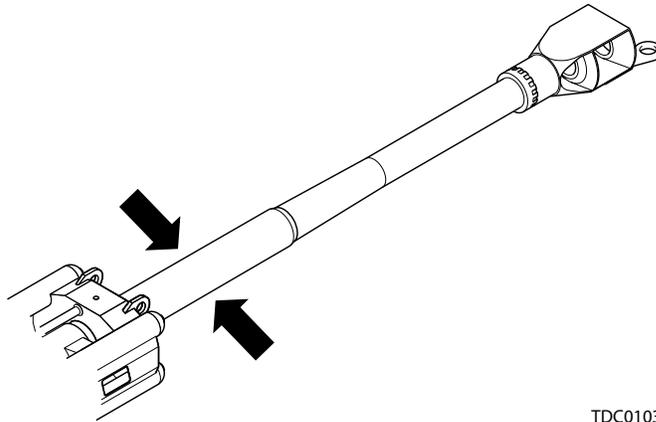
MONTHLY NOTES

NOTE 23

CANNON TUBE (C)

Inspect cannon tube for presence of dark film lubricant. If loose or flaking, clean only affected areas with CLP (item 7, appx D) and a crocus cloth (item 11, appx D), wipe off excess CLP 7 with a clean wiping rag (item 29, appx D). Apply WTR (item 16/17, appx D) to exposed areas where the dry film lubricant was removed or is missing.

Remove any corrosion on the slide surface of the cannon tube and apply WTR (item 16/17, appx D) to bare area.



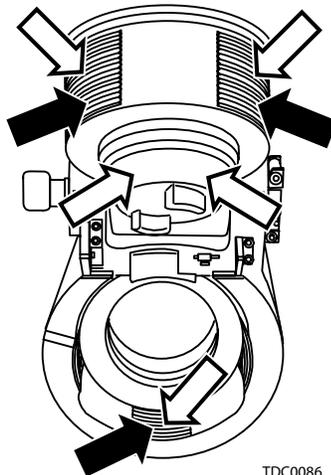
TDC0103

NOTE 24

BREECH MECHANISM ASSEMBLY (C)

Remove PFM, clean with CLP (item 7, appx D), and wipe dry with a clean wiping rag (item 29, appx D).

Clean breech mechanism assembly with CLP (item 7, appx D), and wipe dry with a clean wiping rag (item 29, appx D). Lube with CLP (item 7, appx D). Apply WTR (item 16/17, appx D) to threads of breechblock and breechring assemblies.



TDC0086

Section II. TROUBLESHOOTING PROCEDURES

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3-4	Troubleshooting Procedures	3-20

3-2 INTRODUCTORY INFORMATION

- a.** Use the Symptom Index (Para 3-3) as a quick guide to troubleshooting. Common malfunctions are listed in alphabetical order with a page number reference to the troubleshooting table where a test or inspection and corrective action are provided.
- b.** The Troubleshooting Procedures (Para 3-4) lists possible malfunctions, which you may find during operation or maintenance of the howitzer or its components. Perform the tests/inspections and corrective actions in the order listed.
- c.** This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective action, notify your SC.
- d.** This section contains information on corrective actions used to return the howitzer to normal operation. This section cannot list all malfunctions that may occur, or all tests, inspections and corrective actions. If a malfunction is not listed, or is not corrected by corrective actions, notify unit maintenance.
- e.** Crewmembers should report all malfunctions to the SC. This information aids on-board test equipment to accurately predict and determine faults. The BIT automatically tests DFCS. It predicts and determines failures of system components. System component failures are displayed on the CSD, GND and AGD screens.
- f.** Troubleshooting the howitzer requires the crewmembers to perform unscheduled and scheduled maintenance procedures and to monitor system functions at all times. Troubleshooting is conducted both during operations and during preparation for operations.
- g.** With all automatic weapons system operations, attention to detail is imperative for personnel safety. All maintenance checks, services, and tests should be performed only when safety is not in jeopardy. Before performing troubleshooting tasks, carefully read the operating instructions and follow all notes, cautions, and warnings.
- h.** The DFCS has three levels of Built-In-Test (BIT) available to identify faults:
- (1) Power-Up-BIT (PUBIT).** The PUBIT is a self-test of the DFCS that is conducted when the DFCS power mode switch on the PSP is turned ON or to COMM.
 - (2) Operational-BIT (OBIT).** The OBIT is an automated process of periodically assessing the status of the DFCS during normal operations.
 - (3) Operator-Initiated-BIT (OIBIT).** The OIBIT is a semi-automated process to assess the status of the DFCS.

3-3 SYMPTOM INDEX

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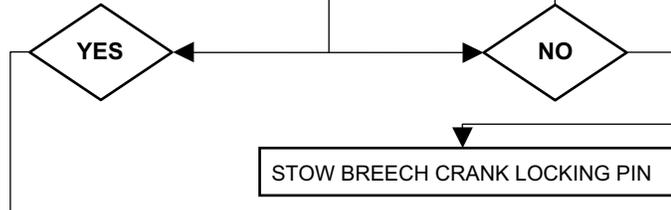
3-4 TROUBLESHOOTING PROCEDURES

Table 3-1 Troubleshooting

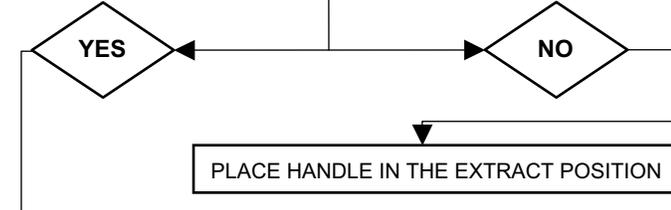
CANNON	BREECH WILL NOT OPEN
---------------	-----------------------------

NOTE
 THE BREECH CAN ONLY BE OPERATED WHEN THE LOADING TRAY IS FULLY STOWED (RAISED).

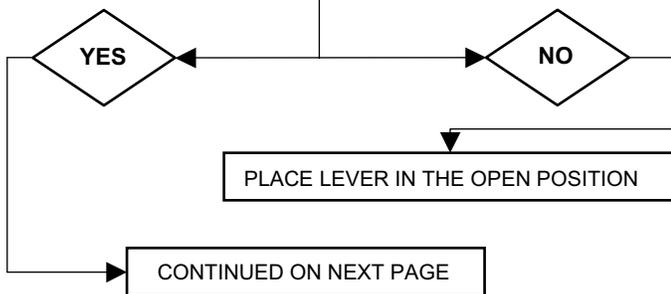
A CHECK THE BREECH CRANK LOCKING PIN IS STOWED.
 IS THE PIN STOWED?



B CHECK THE PFM MANUAL HANDLE IS IN THE EXTRACT POSITION.
 IS THE HANDLE IN THE EXTRACT POSITION?



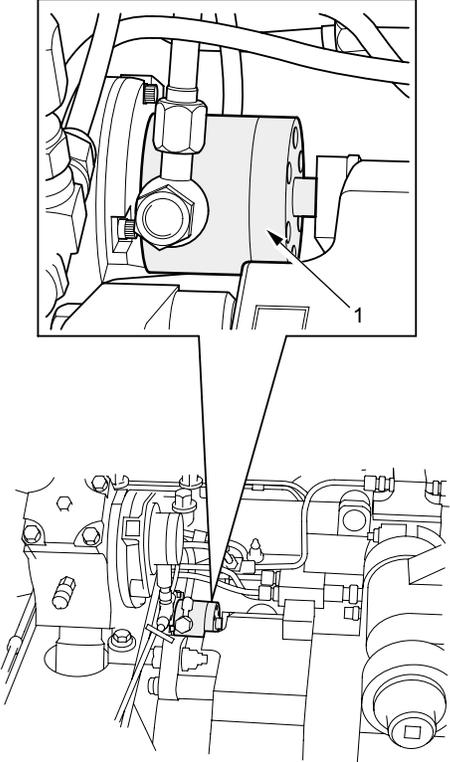
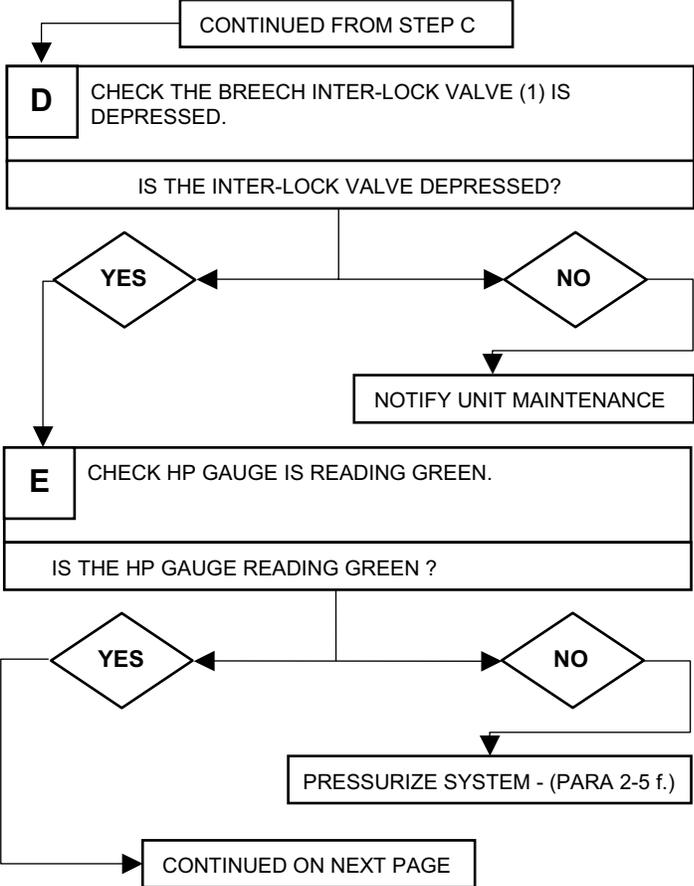
C CHECK THE BREECH LEVER IS IN THE OPEN POSITION.
 IS THE LEVER IN THE OPEN POSITION?



TDC0674

Table 3-1 Troubleshooting (cont)

CANNON (cont) **BREECH WILL NOT OPEN (cont)**

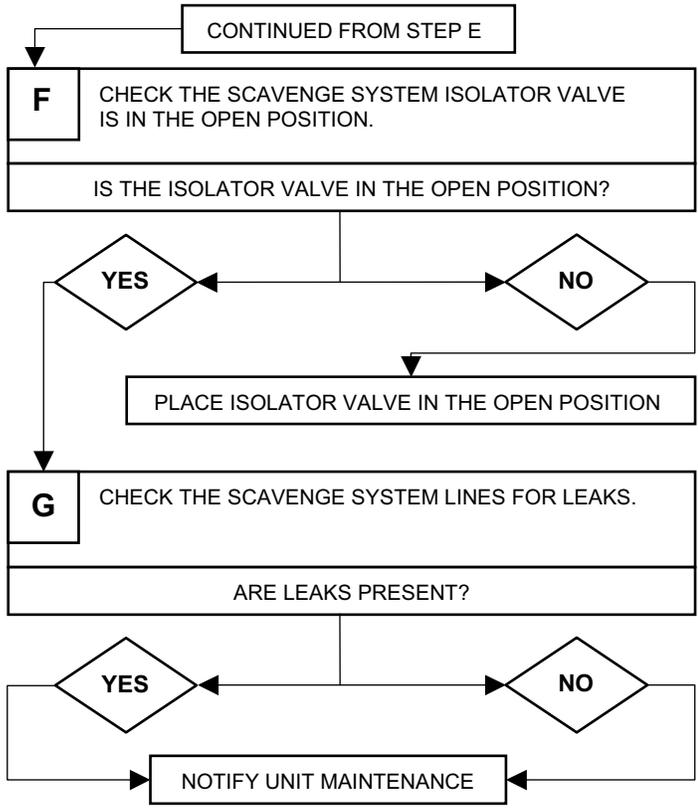


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3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

CANNON (cont)	BREECH WILL NOT OPEN (cont)
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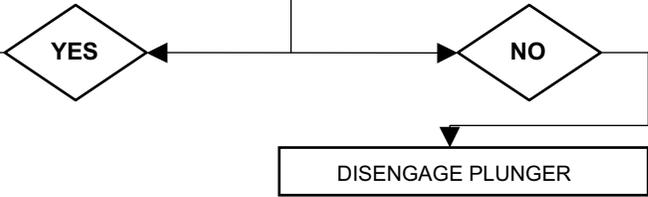
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Table 3-1 Troubleshooting (cont)

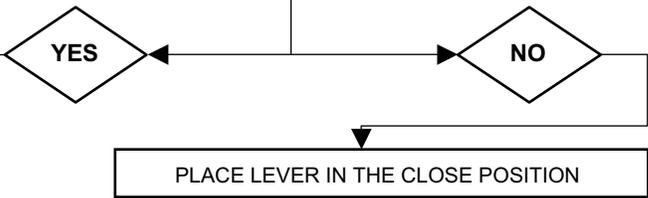
CANNON (cont) BREECH WILL NOT CLOSE

NOTE
THE BREECH CAN ONLY BE OPERATED WHEN THE LOADING TRAY IS FULLY STOWED (RAISED).

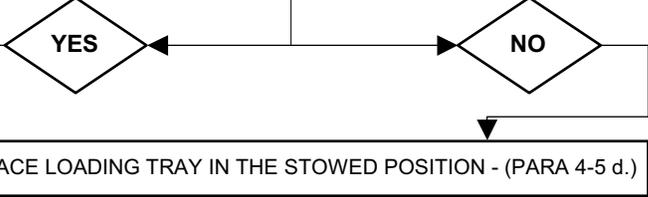
A CHECK THAT THE BREECH LOCKOUT PLUNGER IS ENGAGED.
IS THE PLUNGER ENGAGED?



B CHECK THAT THE BREECH LEVER IS IN THE CLOSE POSITION.
IS THE LEVER IN THE CLOSED POSITION?



C CHECK THAT THE LOADING TRAY IS STOWED (RAISED) POSITION.
IS THE LOADING TRAY IN THE STOWED POSITION?



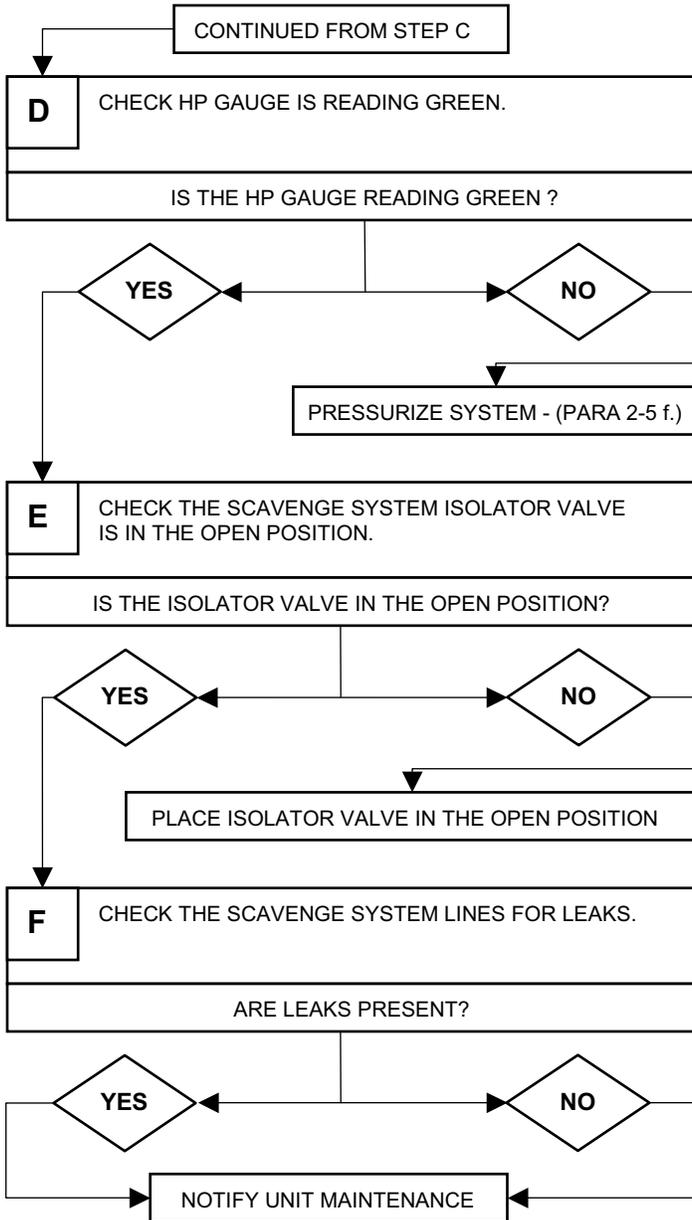
CONTINUED ON NEXT PAGE

TDC0106

3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

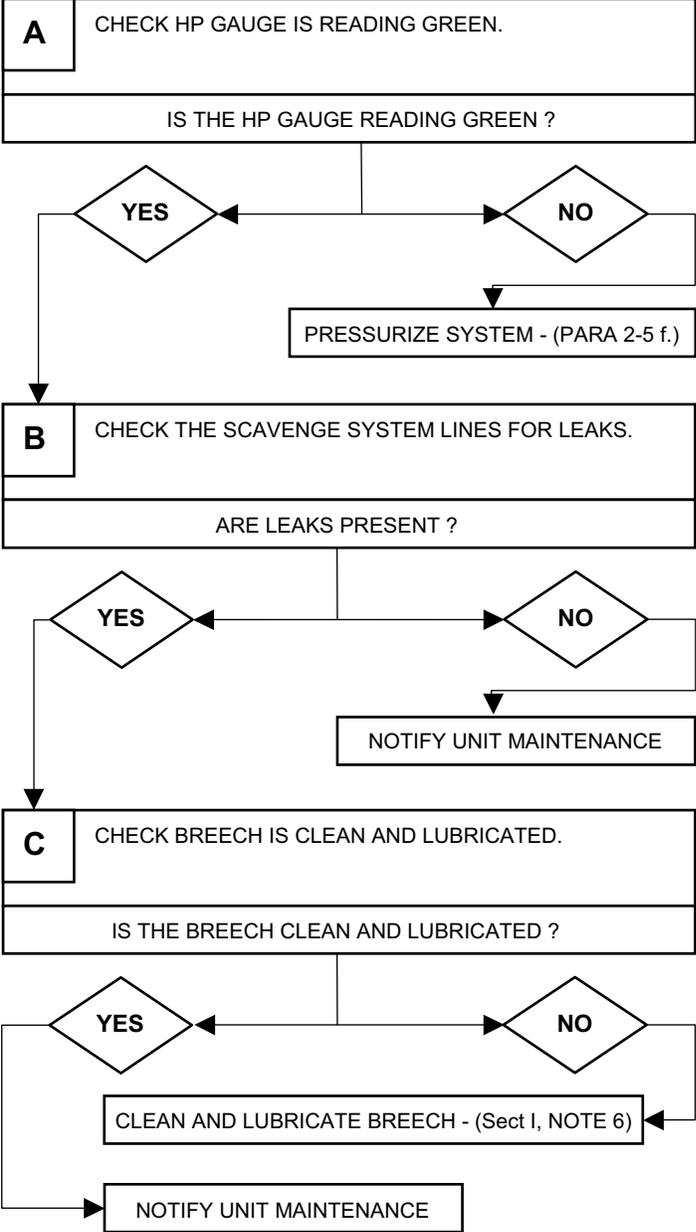
CANNON (cont)	BREECH WILL NOT CLOSE (cont)
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TDC0107

Table 3-1 Troubleshooting (cont)

CANNON (cont)	WITNESS MARKS DO NOT ALIGN
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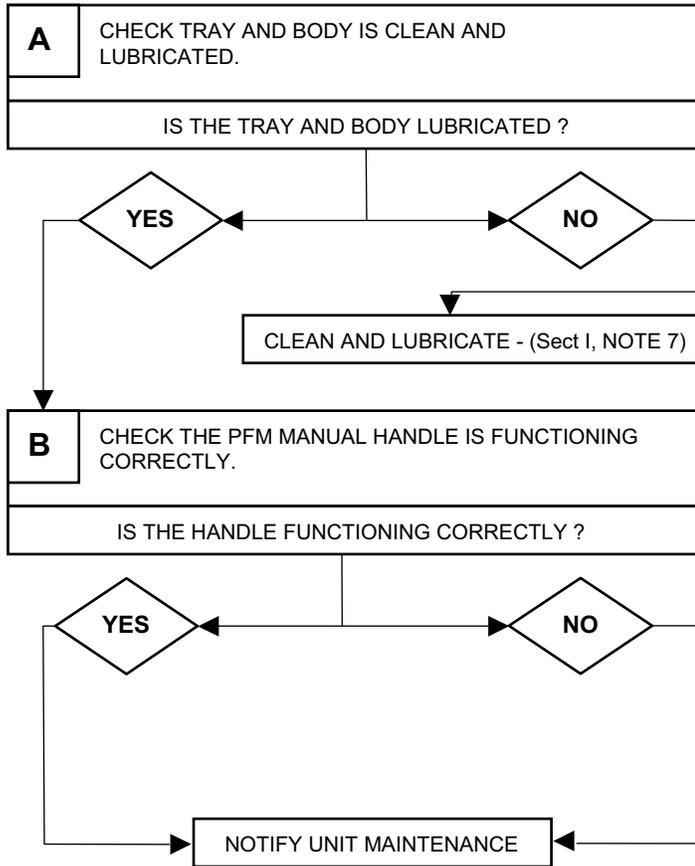


TDC0108

3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

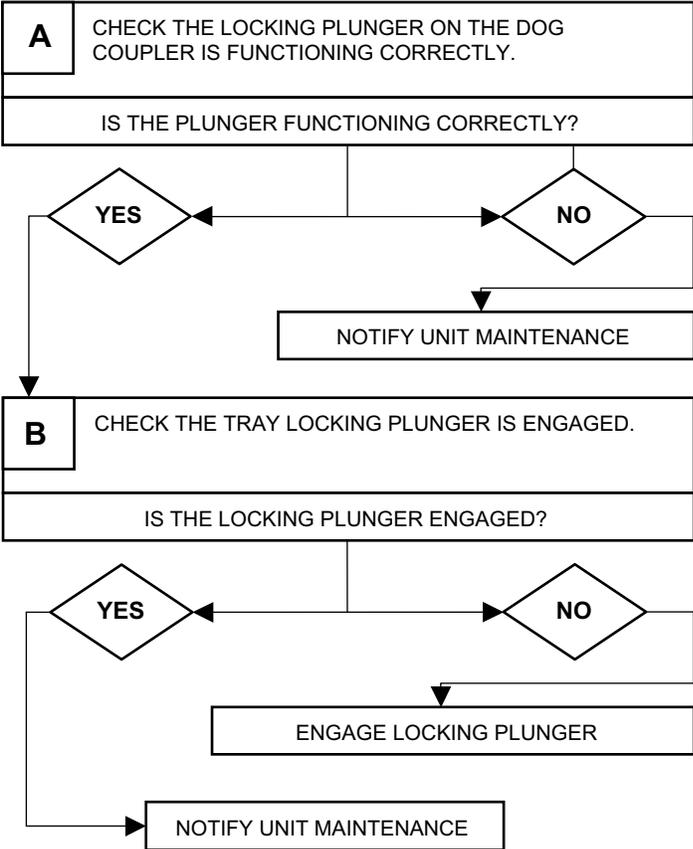
CANNON (cont)	PFM TRAY WILL NOT CYCLE FREELY
----------------------	--------------------------------



TDC0109

Table 3-1 Troubleshooting (cont)

CANNON (cont)	PFM TRAY DROPS DURING FIRING
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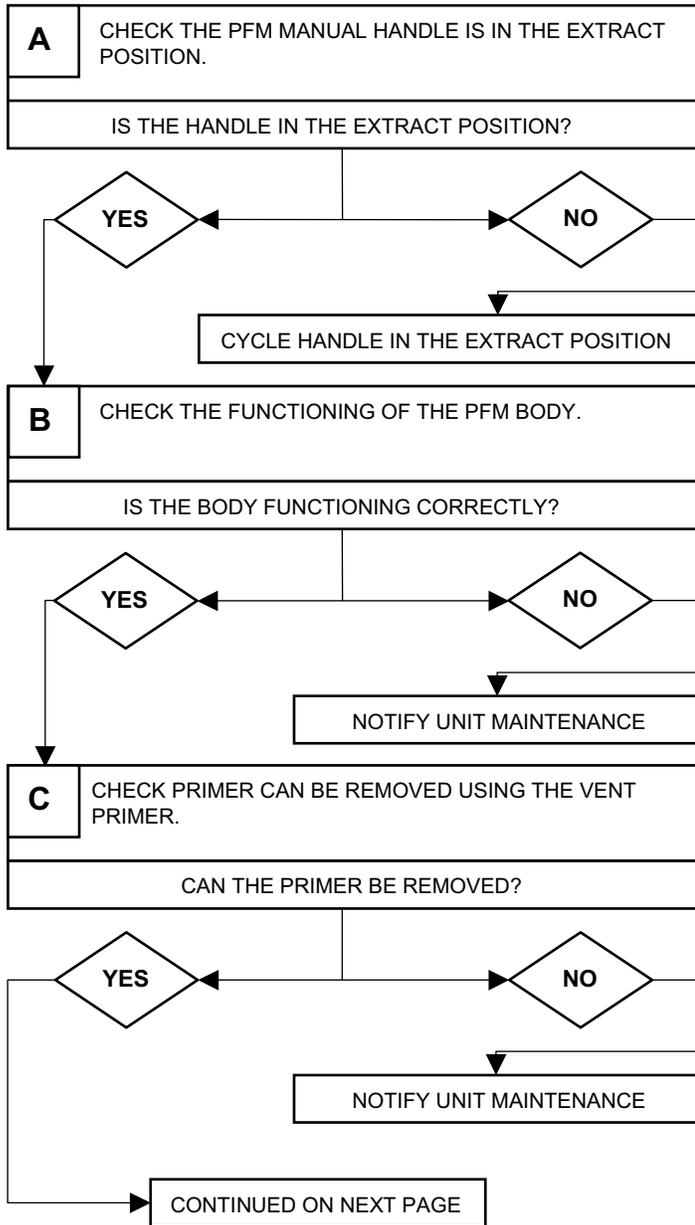


TDC0675

3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

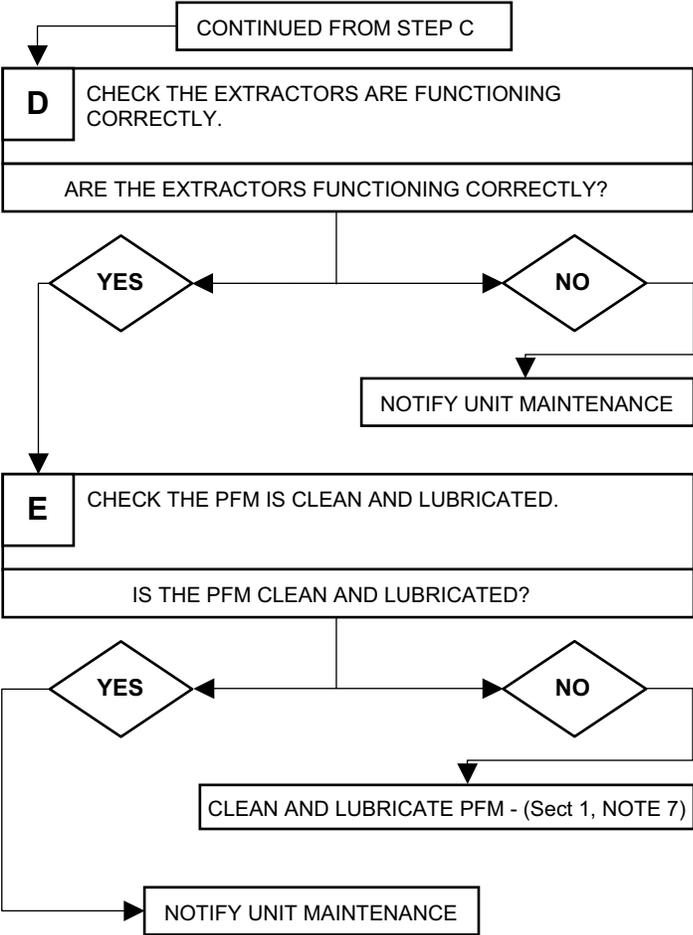
CANNON (cont)	PRIMER WILL NOT EJECT
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TDC0110

Table 3-1 Troubleshooting (cont)

CANNON (cont)	PRIMER WILL NOT EJECT (cont)
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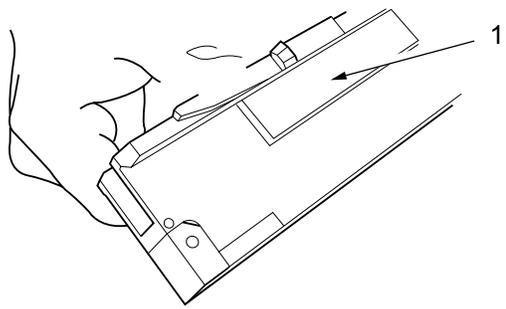
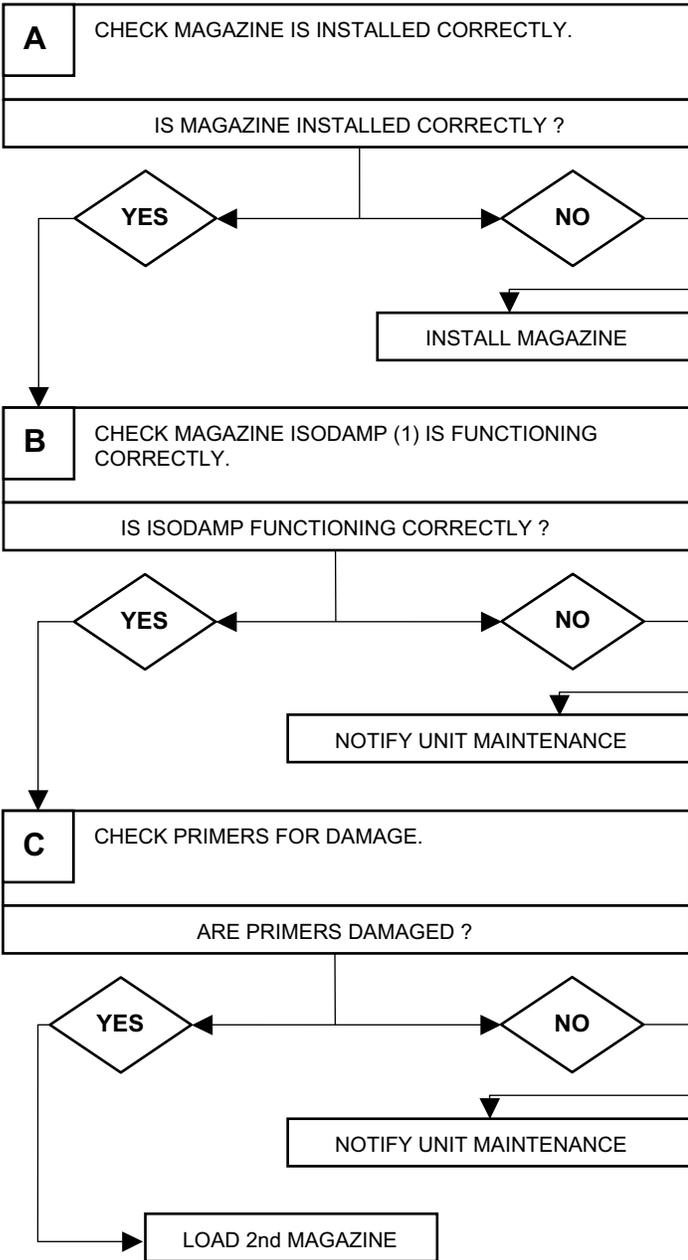


TDC0676

3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

CANNON (cont)	PRIMER CASES DO NOT FEED PROPERLY
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TDC0111

Table 3-1 Troubleshooting (cont)

CANNON (cont)	PRIMER CASES ARE RUPTURED
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REMOVE RUPTURED CASE - (PARA 2-66)

PROPELLANT GAS BLOW-BY DURING FIRING

CEASE FIRING REMOVE AND REPLACE WORN/DAMAGED OBTURATOR - (PARA 3-7g)
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TDC0112

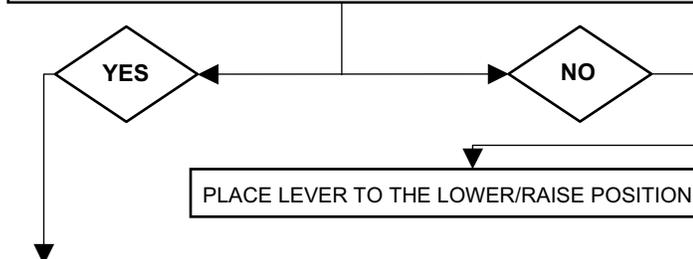
3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

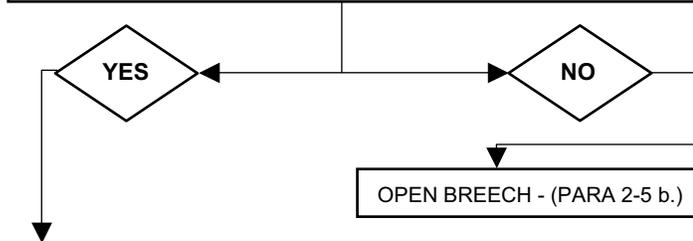
CARRIAGE	LOADING TRAY WILL NOT LOWER AND/OR RAISE
-----------------	--

NOTE
 THE LOADING TRAY CAN ONLY BE OPERATED WHEN THE BREECH IS FULLY OPENED.

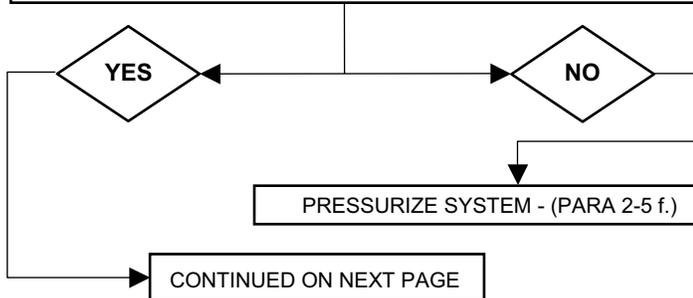
A CHECK THE LOADING TRAY LEVER IS IN THE LOWER/RAISE POSITION.
 IS THE LEVER IN THE LOWER/RAISE POSITION?



B CHECK BREECH IS IN THE OPEN POSITION.
 IS THE BREECH IN THE OPEN POSITION?



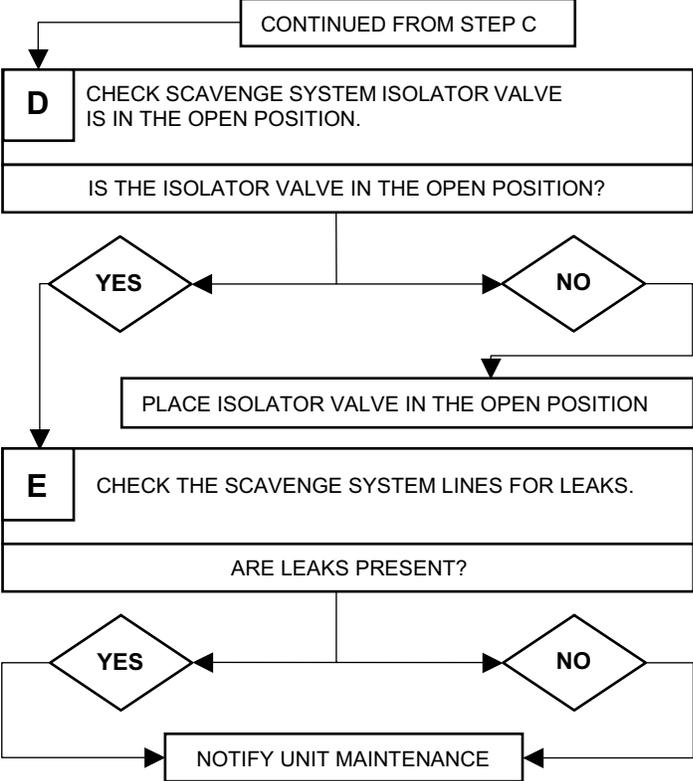
C CHECK HP GAUGE IS READING GREEN.
 IS THE HP GAUGE READING GREEN?



TDC0113

Table 3-1 Troubleshooting (cont)

CARRIAGE (cont)	LOADING TRAY WILL NOT LOWER AND/OR RAISE (cont)
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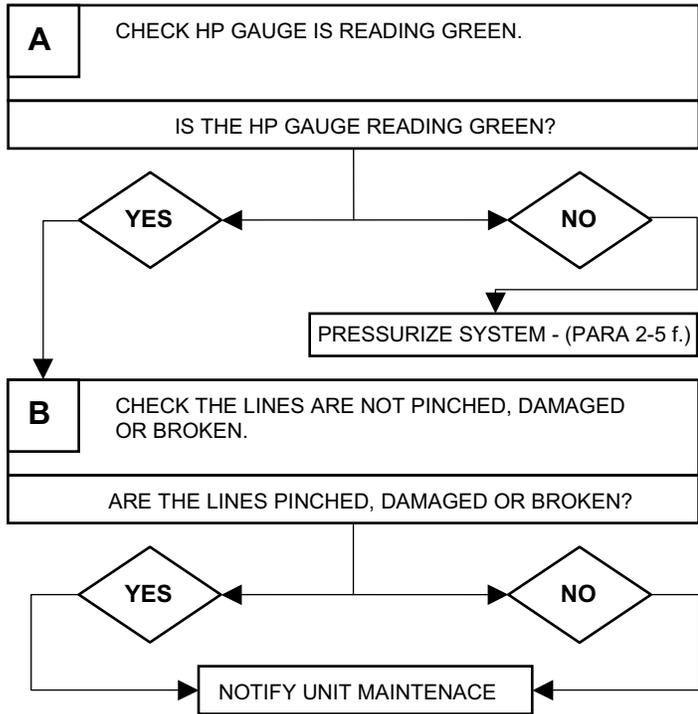


TDC0114

3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

CARRIAGE (cont) LOADING TRAY LOWERS OR RAISES SLOWLY



LOADING TRAY SLAMS INTO BREECH AND/OR SLAMS INTO UP-STOPS

NOTIFY UNIT MAINTENANCE

HOWITZER WILL NOT, OR IS DIFFICULT, TO ELEVATE OR DEPRESS

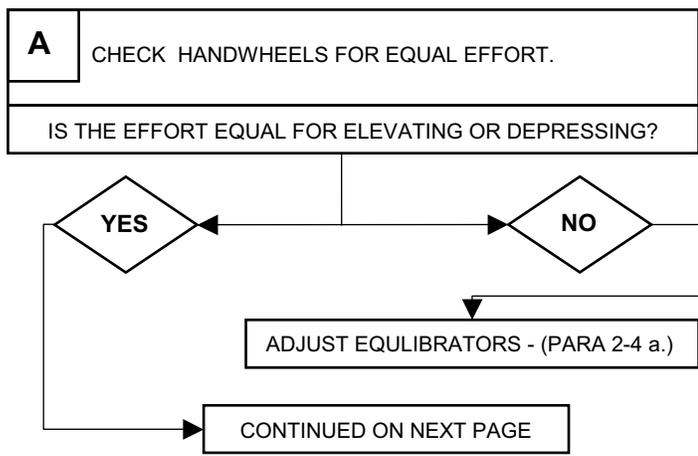
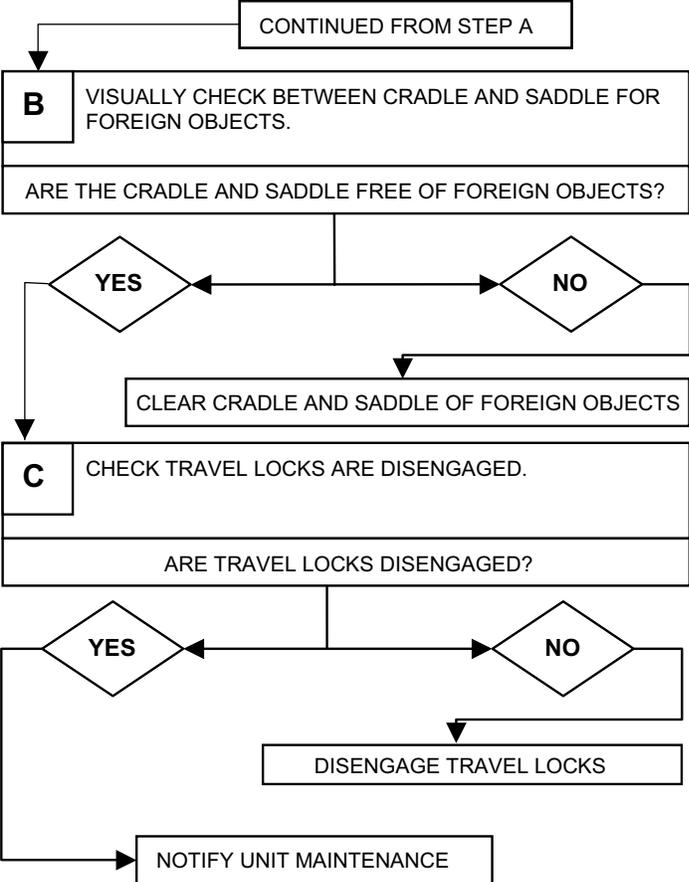


Table 3-1 Troubleshooting (cont)

CARRIAGE (cont) HOWITZER WILL NOT, OR IS DIFFICULT, TO ELEVATE OR DEPRESS (cont)

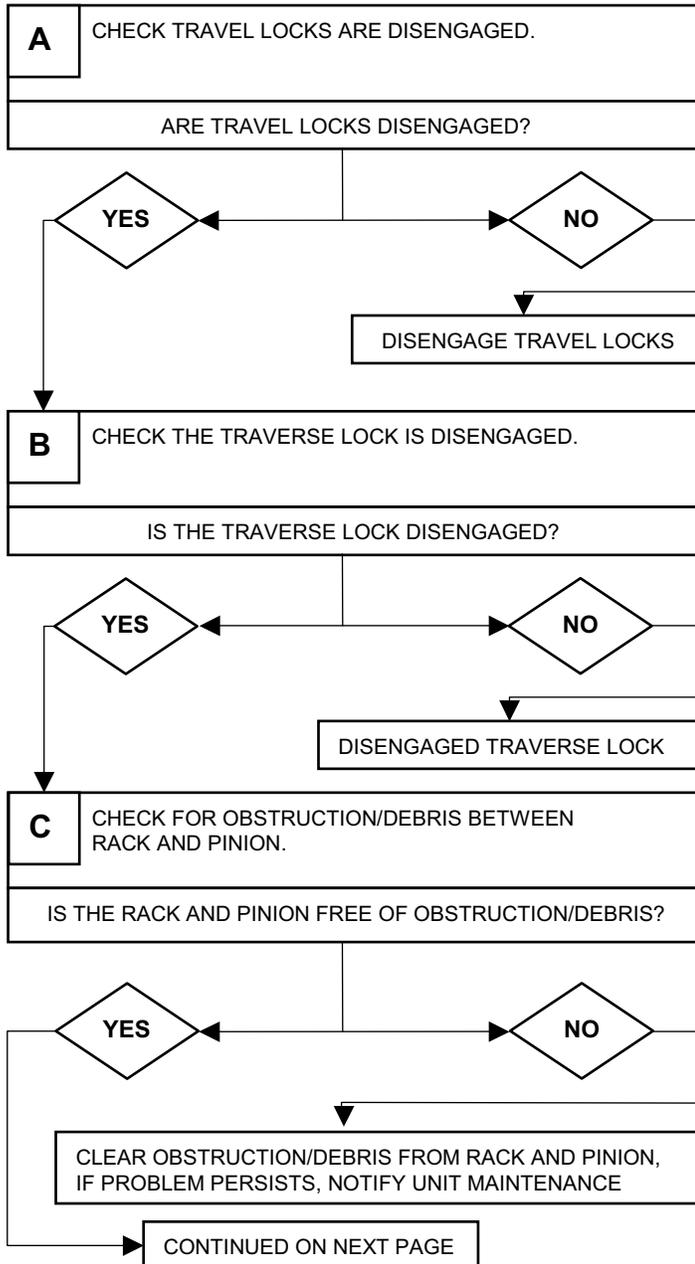


TDC0117

3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

CARRIAGE (cont)	HOWITZER WILL NOT, OR IS DIFFICULT, TO TRAVERSE
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TDC0133

3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

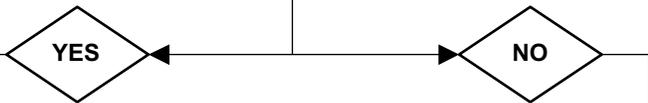
CARRIAGE (cont)	SUSPENSION WILL NOT LOWER TO THE GROUND
------------------------	---

NOTE

ENSURE BUMP STOPS ARE FREE FROM DEBRIS AND/OR FOREIGN OBJECTS.

A CHECK THE STABILIZERS ARE DEPLOYED INTO THE FIRING POSITION AND THE BUMP STOPS ARE RETRACTED.

ARE THE STABILIZERS IN THE FIRING POSITION AND THE BUMP STOPS RETRACTED?



DEPLOY STABILIZERS INTO FIRING POSITION AND ENSURE BUMP STOPS HAVE RETRACTED

WARNING

WHEN SUSPENSION OPERATING VALVE LEVERS ARE OPENED, ENSURE ALL PERSONNEL ARE STANDING CLEAR.

B CHECK SUSPENSION LEVERS ARE SET AT THE LOWER POSITION.

ARE THE LEVERS SET TO THE LOWER POSITION?



SET LEVERS TO LOWER POSITION

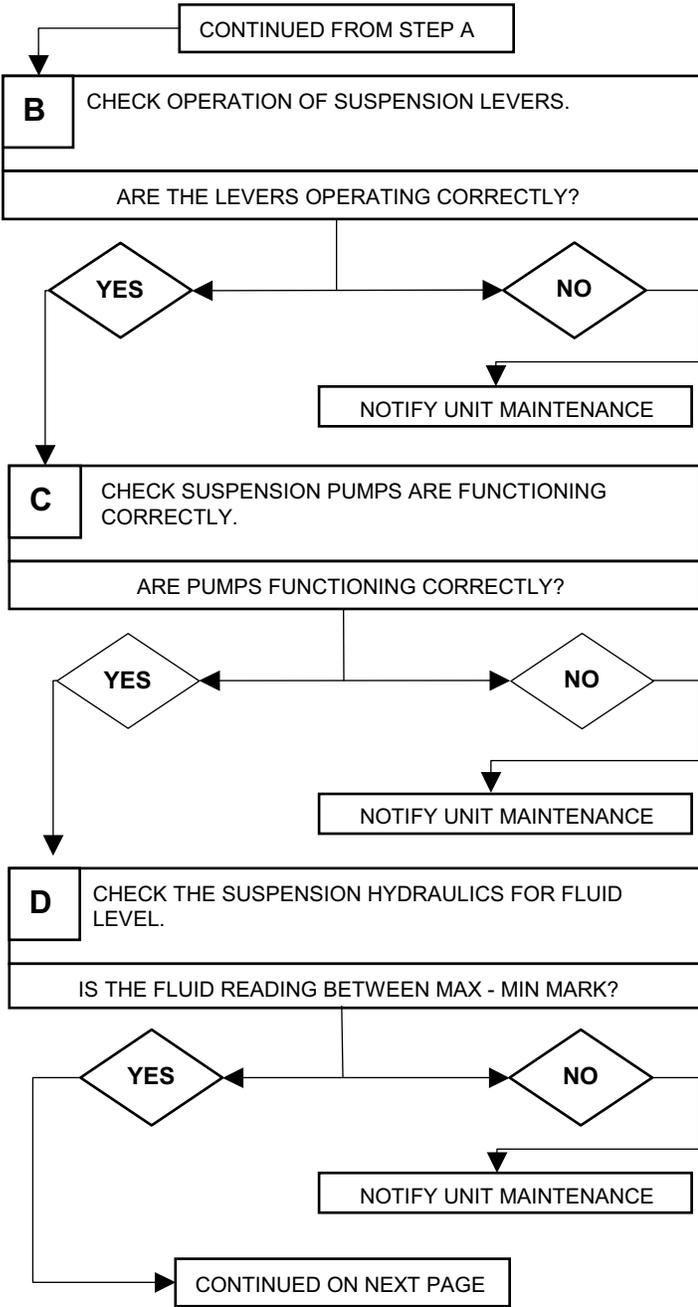
CONTINUED ON NEXT PAGE

TDC0119

3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

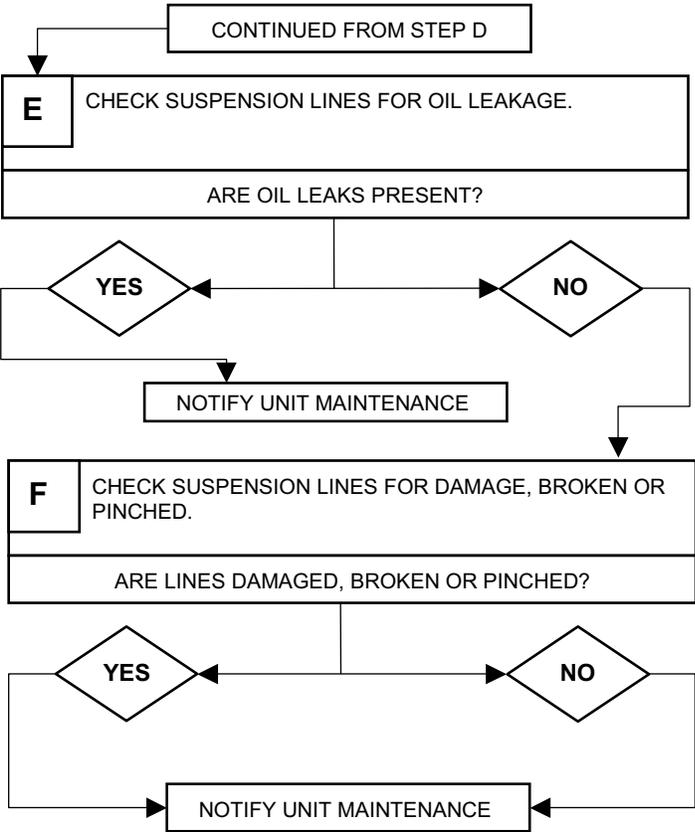
CARRIAGE (cont)	SUSPENSION WILL NOT RAISE, OR FULLY RAISE, HOWITZER (cont)
------------------------	--



TDC0121

Table 3-1 Troubleshooting (cont)

CARRIAGE (cont) SUSPENSION WILL NOT RAISE, OR FULLY RAISE, HOWITZER (cont)

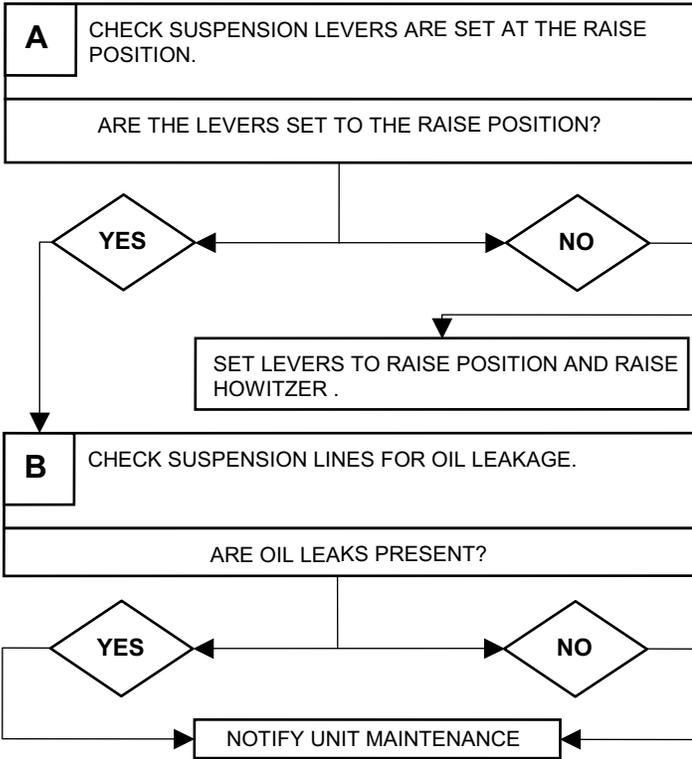


TDC0122

3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

CARRIAGE (cont)	SUSPENSION FAILS DURING TRAVELING
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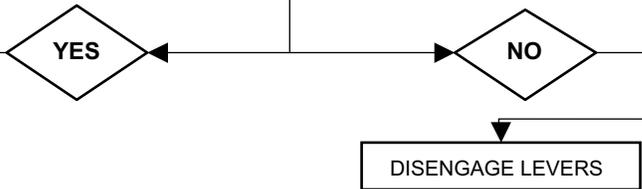
TDC0123

Table 3-1 Troubleshooting (cont)

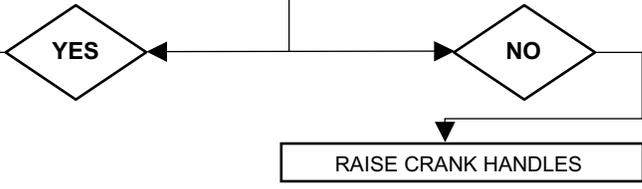
CARRIAGE (cont)	WHEELS ARE DIFFICULT TO THROW OVER
------------------------	---

WARNING
ENSURE HOWITZER HANDBRAKES ARE FULLY APPLIED BEFORE ATTEMPTING TO MOVE WHEEL ARM ASSEMBLY INTO FIRING POSITION, FAILURE TO DO SO WILL RESULT IN INJURY TO PERSONNEL.

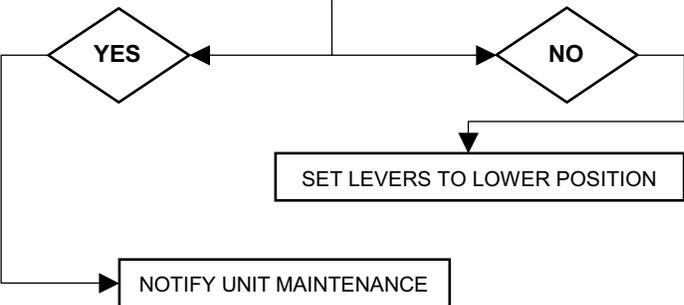
A CHECK THE WHEEL LOCKING LEVERS ARE DISENGAGED.
ARE THE LEVERS DISENGAGED?



B CHECK THE CRANK HANDLES ARE IN THE RAISED (BROKEN) POSITION.
ARE THE HANDLES IN THE RAISED (BROKEN) POSITION?



C CHECK THE SUSPENSION LEVERS ARE IN THE LOWER POSITION.
ARE THE LEVERS IN THE LOWER POSITION?



TDC0124

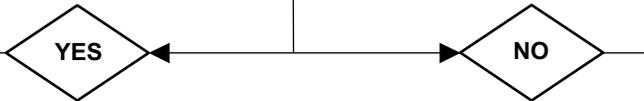
3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

CARRIAGE (cont)	WHEELS WILL NOT ROTATE
------------------------	-------------------------------

A CHECK THE (LH/RH) HANDBRAKE LEVERS DISENGAGED.

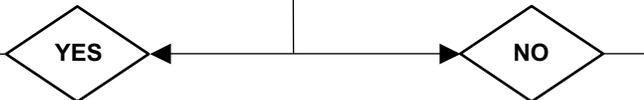
ARE THE (LH/RH) LEVERS DISENGAGED?



DISENGAGE LEVERS

B CHECK AIR SUPPLY IS TURNED ON IN THE PRIME MOVER.

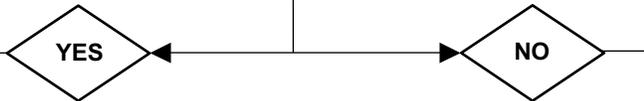
IS THE AIR SUPPLY TURNED ON?



TURN SUPPLY ON

C CHECK DRAIN COCK IS IN THE CLOSED POSITION.

IS THE DRAIN COCK IN THE CLOSED POSITION?



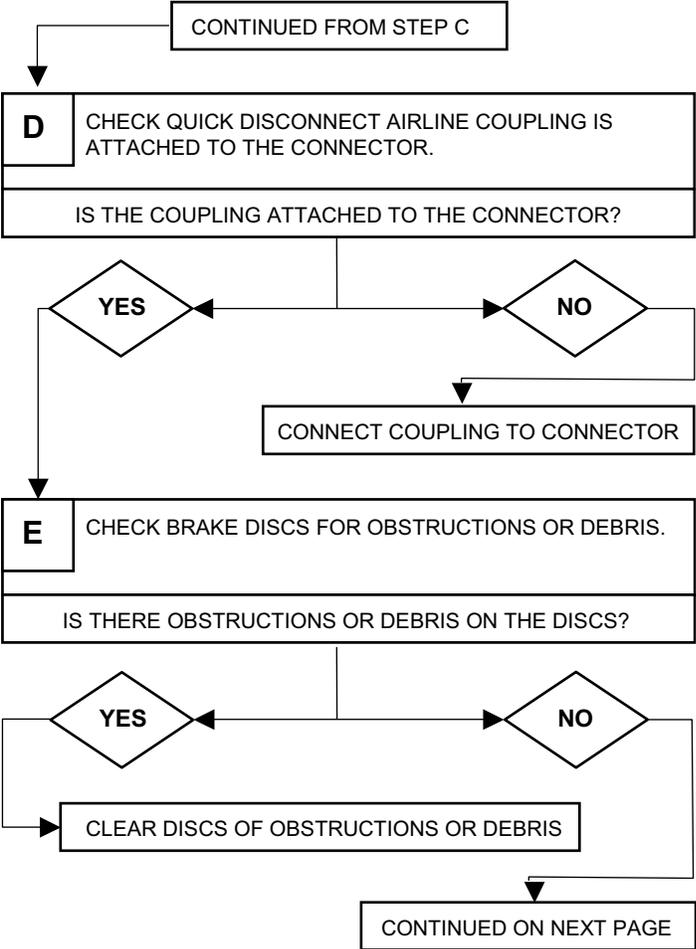
CLOSE DRAIN COCK

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TDC0127

Table 3-1 Troubleshooting (cont)

CARRIAGE (cont)	WHEELS WILL NOT ROTATE (cont)
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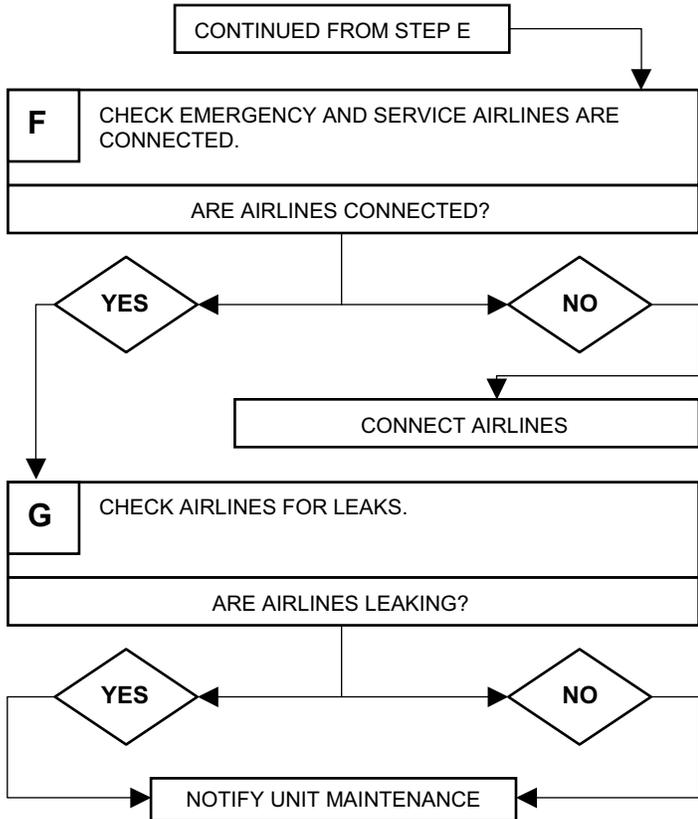


TDC0659

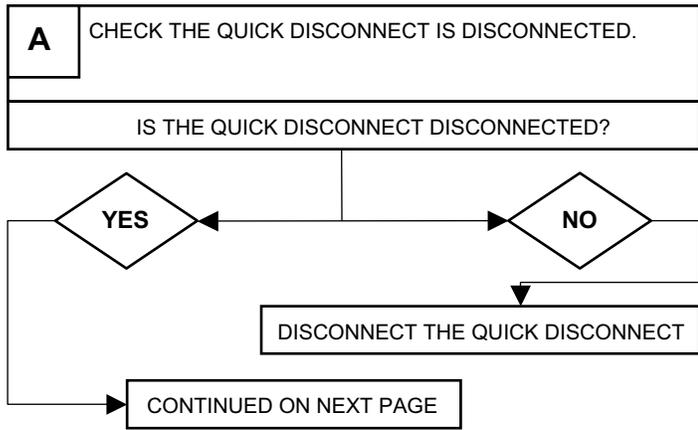
3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

CARRIAGE (cont) **WHEELS WILL NOT ROTATE (cont)**



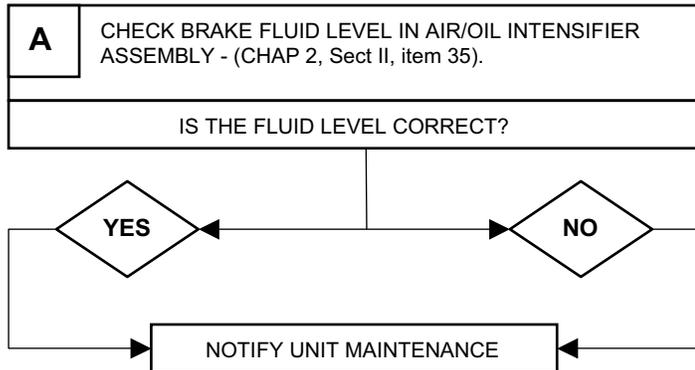
HANDBRAKE LEVER IS DIFFICULT TO RELEASE



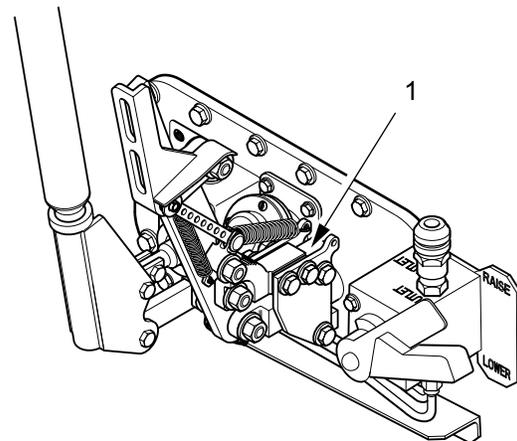
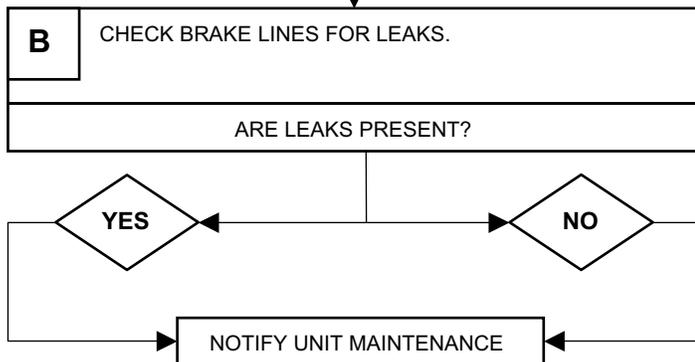
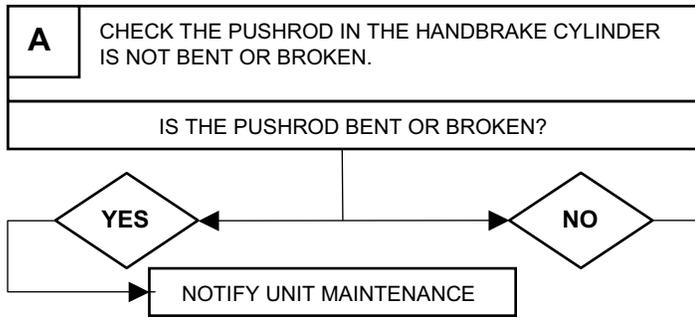
3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

CARRIAGE (cont)	HANDBRAKE LEVER OVER TRAVELS
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	BRAKE DOES NOT OPERATE WHEN HANDBRAKE IS ENGAGED
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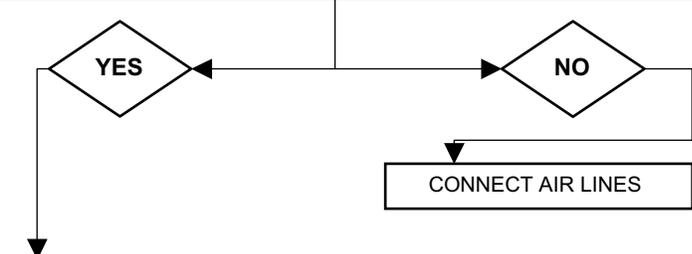
TDC0130

Table 3-1 Troubleshooting (cont)

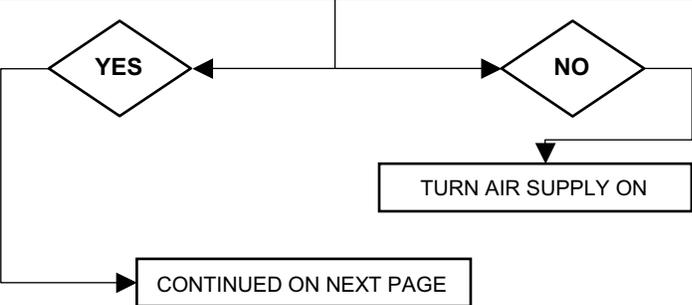
CARRIAGE (cont)	BRAKE DOES NOT OPERATE WHEN PRIME MOVER BRAKES ARE APPLIED
------------------------	--

WARNING
PERSONNEL SHOULD STAY CLEAR OF AREA BETWEEN PRIME MOVER AND HOWITZER.

A	CHECK TO SEE IF THE SERVICE AND EMERGENCY AIRLINES ARE CORRECTLY CONNECTED TO THE PRIME MOVER.
ARE THE AIRLINES CONNECTED CORRECTLY?	



B	CHECK THE AIR SUPPLY ON THE PRIME MOVER IS ON.
IS THE AIR SUPPLY ON?	

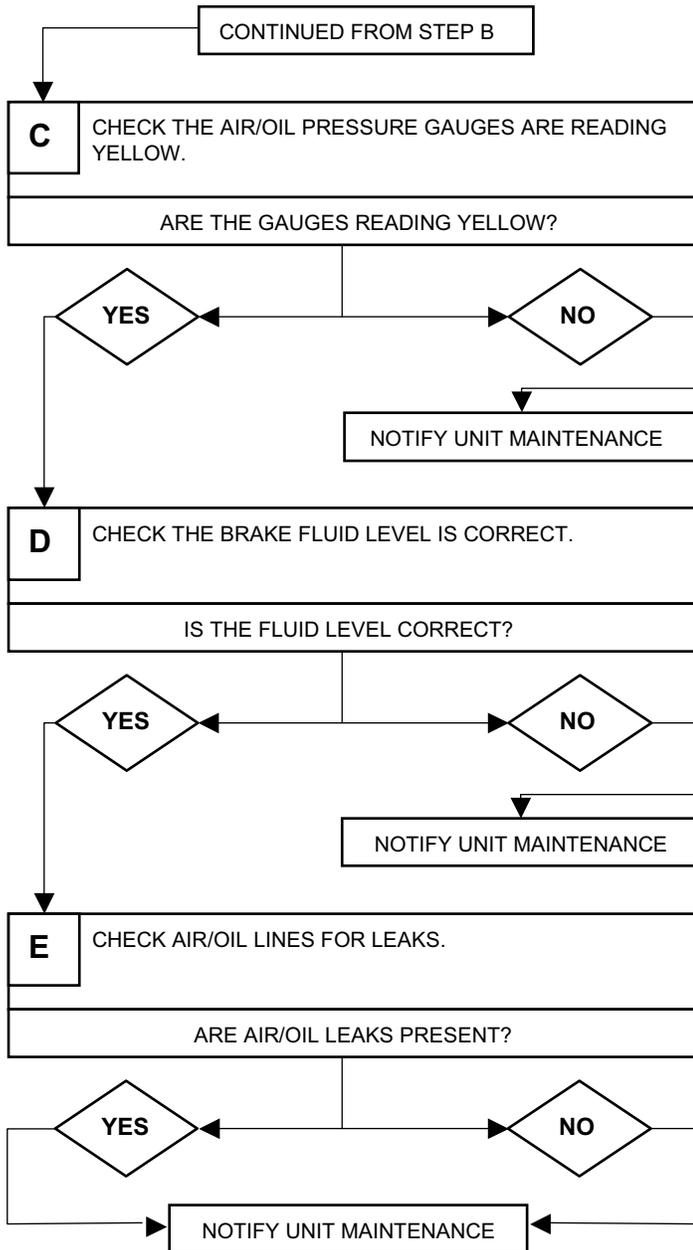


TDC0131

3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

CARRIAGE (cont)	BRAKE DOES NOT OPERATE WHEN PRIME MOVER BRAKES ARE APPLIED (cont)
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TDC0132

Table 3-1 Troubleshooting (cont)

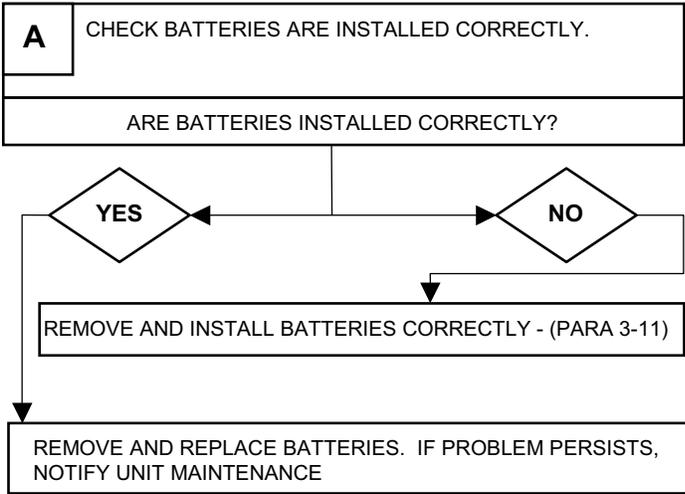
FIRE CONTROL EQUIPMENT	MOISTURE IN FIRE CONTROL EQUIPMENT
-------------------------------	---

NOTIFY UNIT MAINTENANCE

COUNTERS, LEVEL VIALS, OR RETICLES, ARE NOT ILLUMINATED, WILL NOT ILLUMINATE, OR ARE INTERMITTENT



WARNING
 Read and follow all warnings in WARNING SUMMARY.
 Pay careful attention to those about batteries.



TDC0135

3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

FIRE CONTROL EQUIPMENT (cont) FIRE CONTROL KNOBS DO NOT TURN FREELY

NOTIFY UNIT MAINTENANCE

COUNTER DIALS, RETICLES, OR LEVEL VIALS, ARE BROKEN

NOTIFY UNIT MAINTENANCE

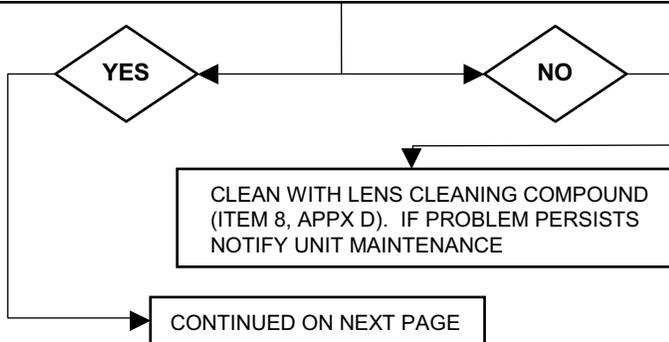
FITTED PARTS OF FIRE CONTROL EQUIPMENT ARE LOOSE

NOTIFY UNIT MAINTENANCE

M1A2 COLLIMATOR RETICLE IMAGE IS NOT SHARP

A CHECK PANTEL IS PROVIDING A CLEAR IMAGE AND IS NOT DIRTY, WET, OR FOGGED.

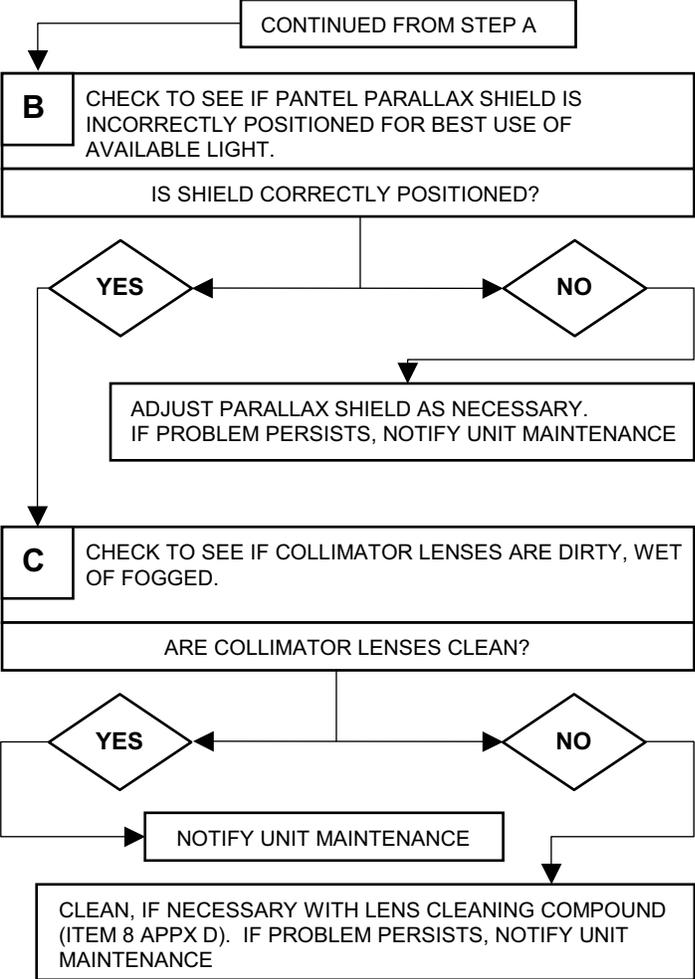
IS THE PANTEL PROVIDING A CLEAR IMAGE AND IS CLEAN?



TDC0136

Table 3-1 Troubleshooting (cont)

FIRE CONTROL EQUIPMENT (cont) M1A2 COLLIMATOR RETICLE IMAGE IS NOT SHARP (cont)



TDC0137

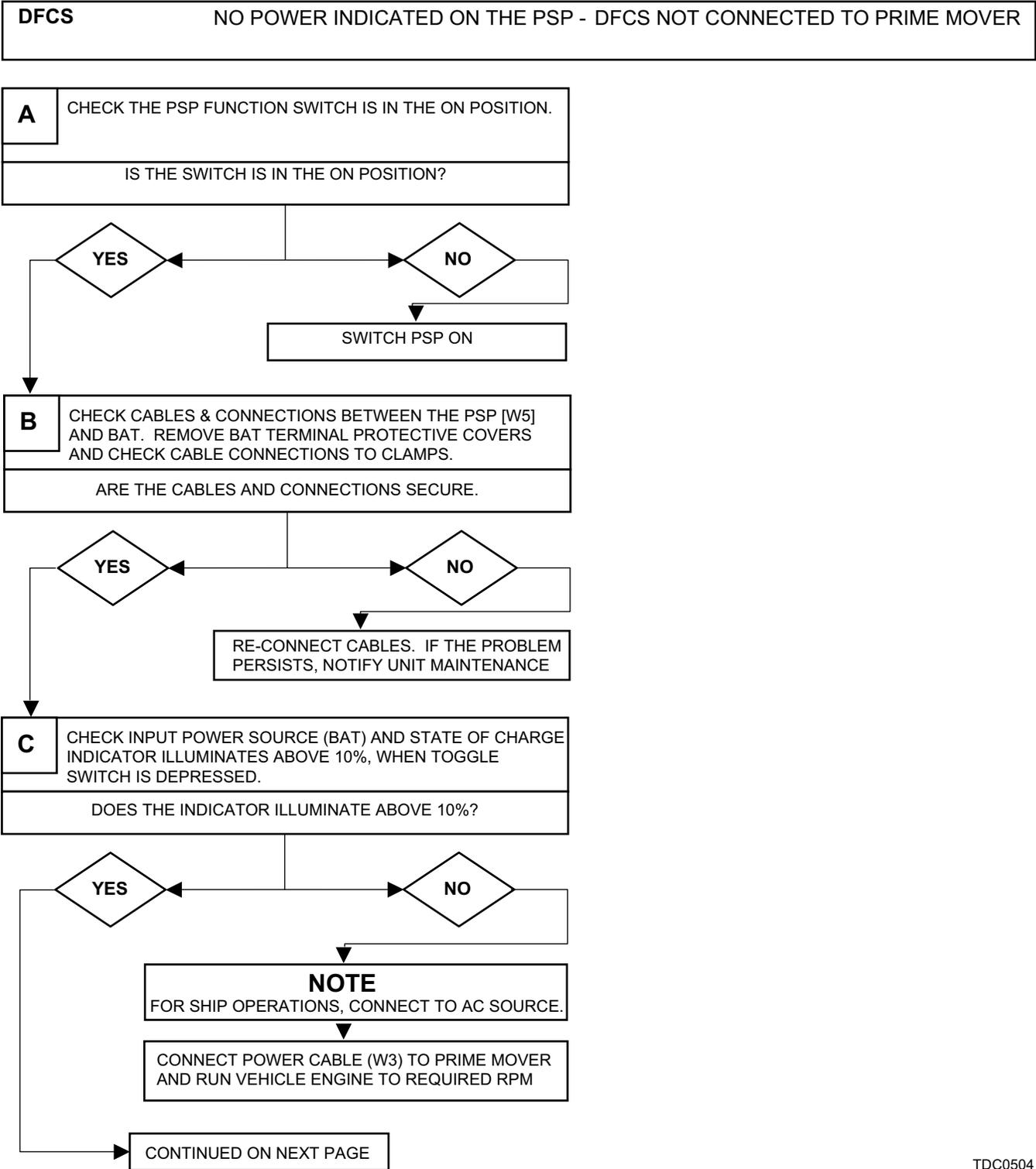
3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

RECOIL MECHANISM	EXCESSIVE RECOIL OF CANNON ASSEMBLY
CEASE FIRING NOTIFY UNIT MAINTENANCE	
	CANNON ASSEMBLY HAS JERKY RECOIL
CEASE FIRING NOTIFY UNIT MAINTENANCE	
	CANNON ASSEMBLY SLAMS INTO BATTERY
CEASE FIRING NOTIFY UNIT MAINTENANCE	
	CANNON ASSEMBLY DOES NOT RETURN TO BATTERY
CEASE FIRING NOTIFY UNIT MAINTENANCE	
	UNDER RECOIL OF CANNON ASSEMBLY
CEASE FIRING NOTIFY UNIT MAINTENANCE	

TDC0139

Table 3-1 Troubleshooting (cont)

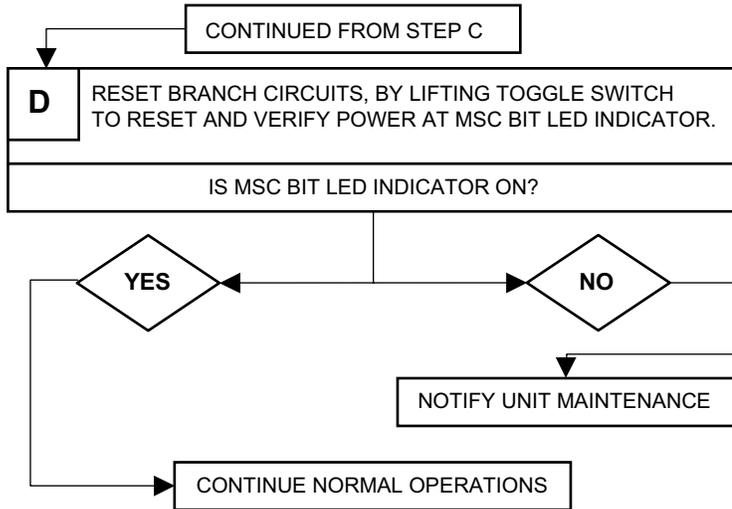


TDC0504

3-4 TROUBLESHOOTING PROCEDURES (cont)

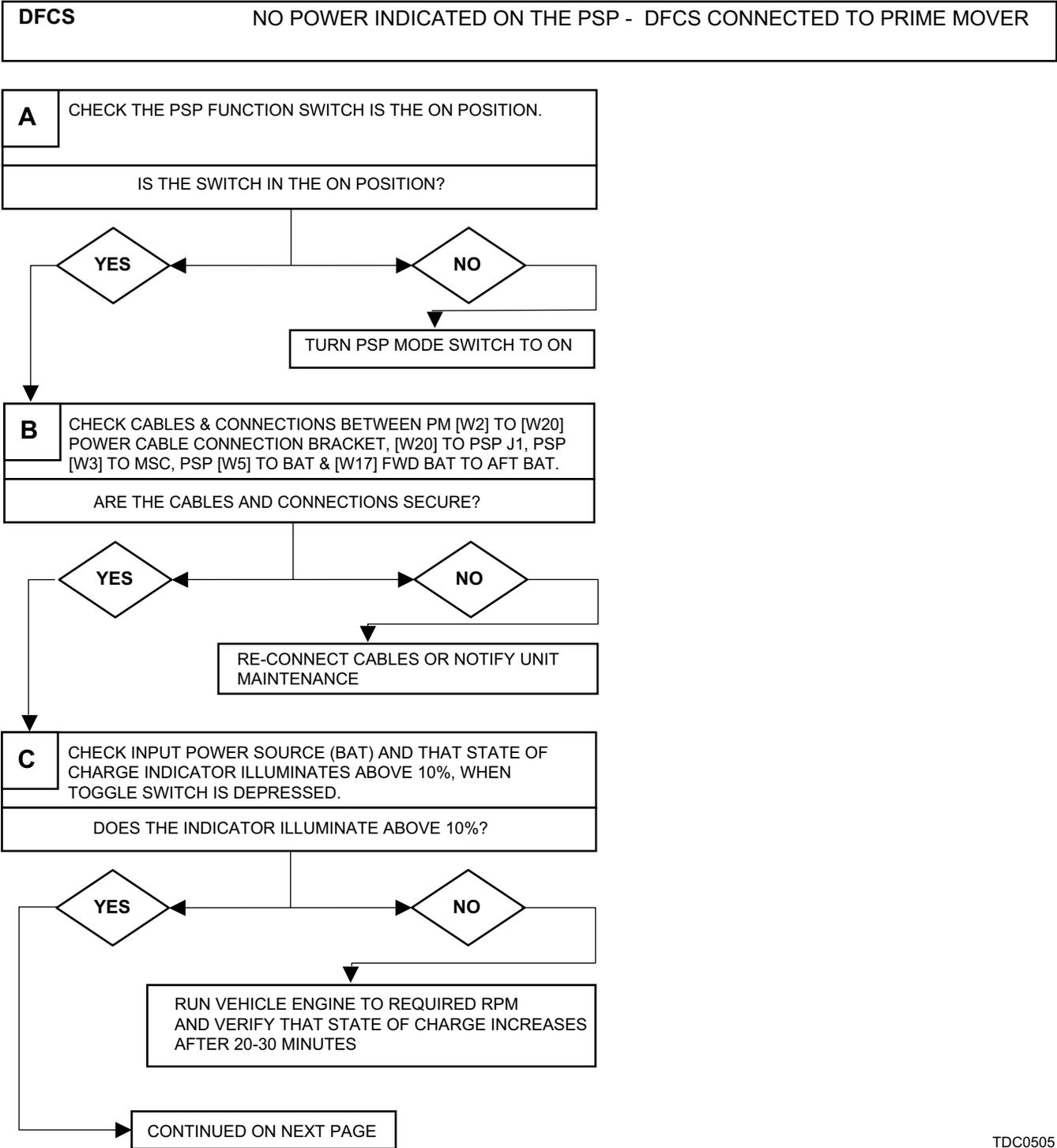
Table 3-1 Troubleshooting (cont)

DFCS (cont)	NO POWER INDICATED ON THE PSP - DFCS NOT CONNECTED TO PRIME MOVER (cont)
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TDC0637

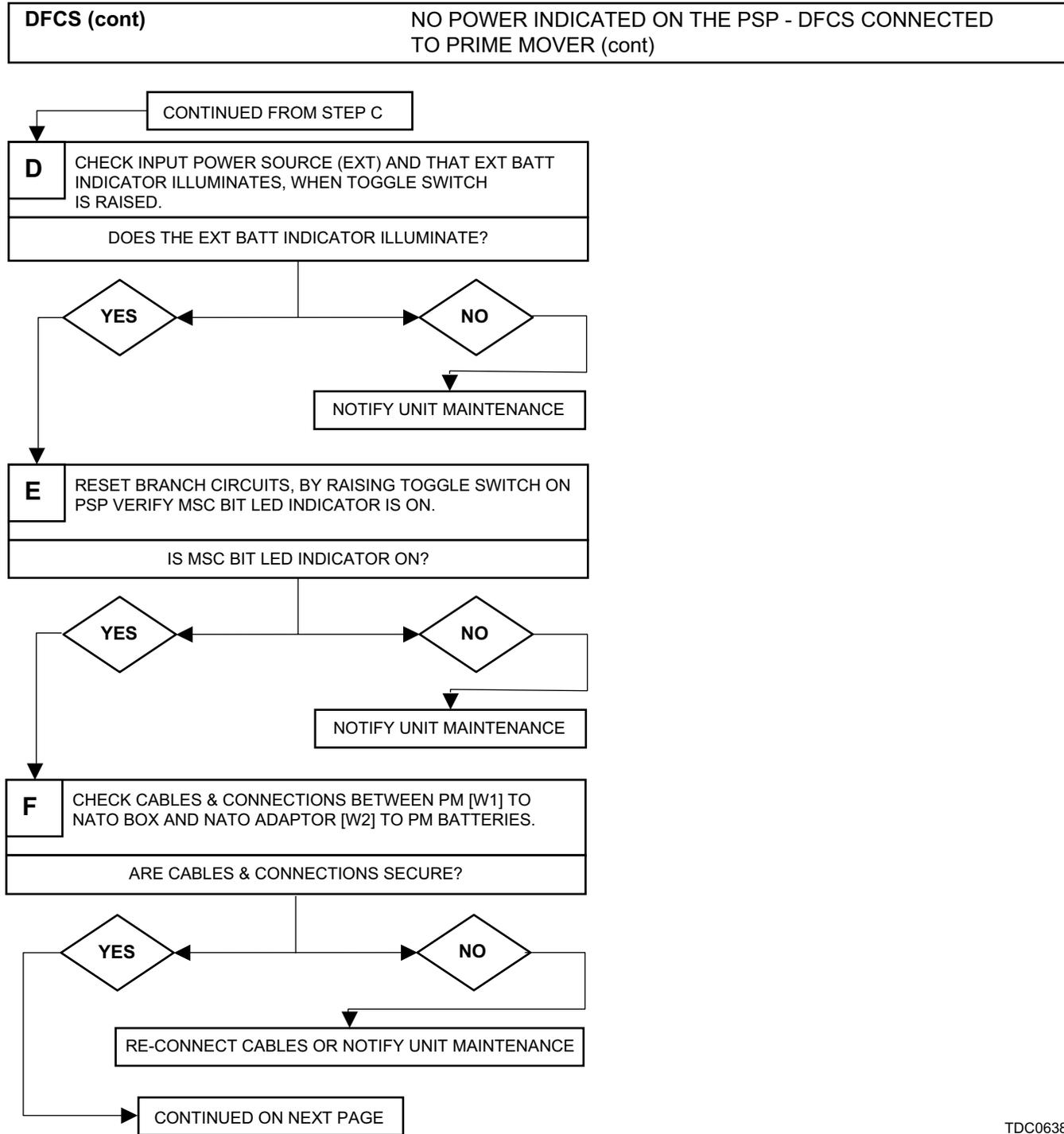
Table 3-1 Troubleshooting (cont)



TDC0505

3-4 TROUBLESHOOTING PROCEDURES (cont)

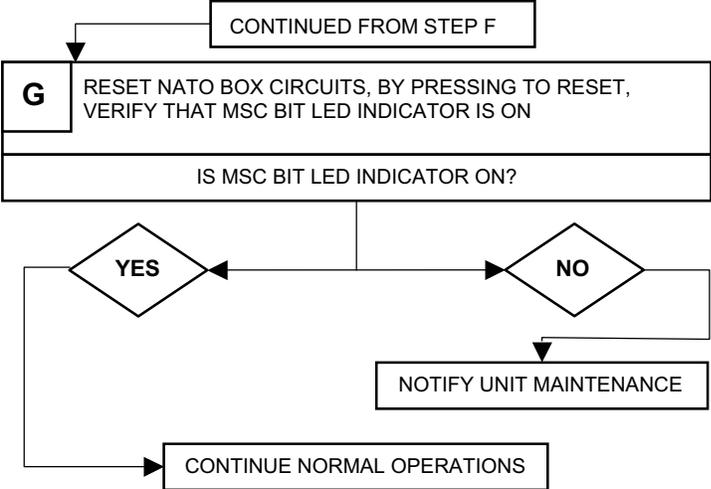
Table 3-1 Troubleshooting (cont)



TDC0638

Table 3-1 Troubleshooting (cont)

DFCS (cont)	NO POWER INDICATED ON THE PSP - DFCS CONNECTED TO PRIME MOVER (cont)
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TDC0639

3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

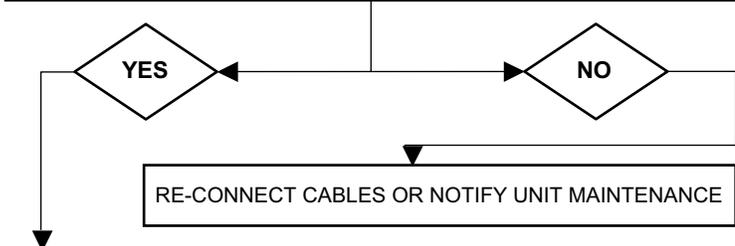
DFCS (cont)	CSD OUT/DEGRADED/ ___ ___
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NOTE

VERIFY "NO POWER INDICATED ON THE PSP" TROUBLESHOOTING HAS BEEN COMPLETED BEFORE CARRYING OUT PROCEEDING STEPS.

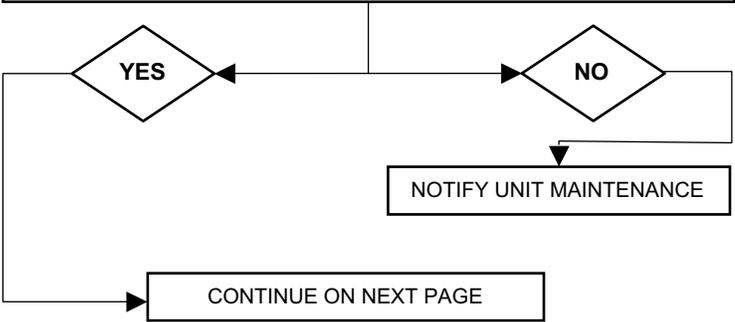
A CHECK CABLES & CONNECTIONS BETWEEN CSD [W16] TO [E4] DATA CONNECTION BRACKET AND [W4] TO MSC J2

ARE THE CABLES AND CONNECTIONS SECURE?



B RESET BRANCH CIRCUITS AT PSP BY RAISING TOGGLE SWITCH AND OBSERVE CSD TURNS ON.

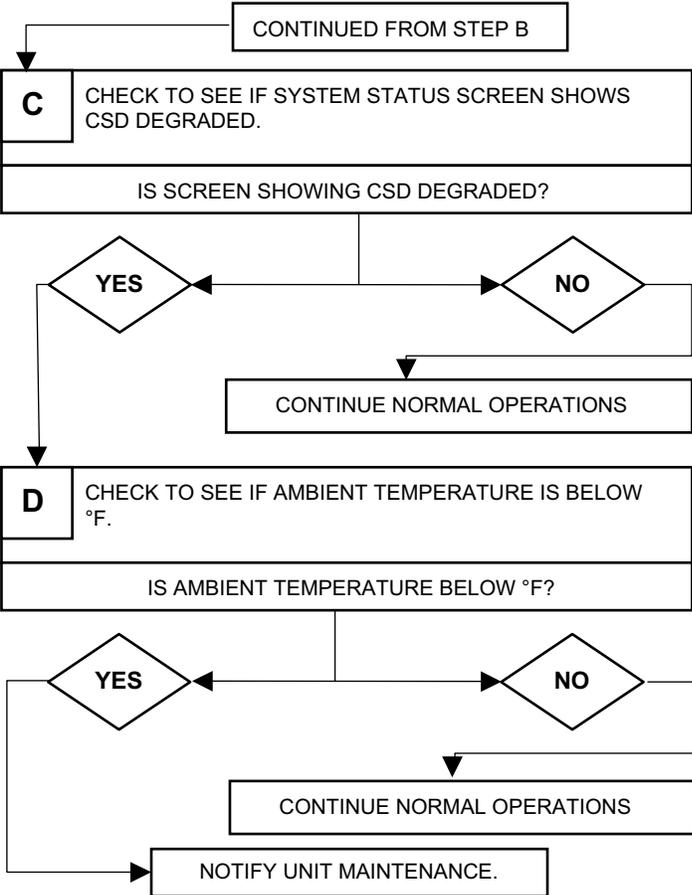
WHEN RESETTING BRANCH CIRCUITS AT PSP, DOES THE CSD TURN ON?



TDC0506

Table 3-1 Troubleshooting (cont)

DFCS (cont)	CSD OUT/DEGRADED/ — — (cont)
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TDC0643

3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

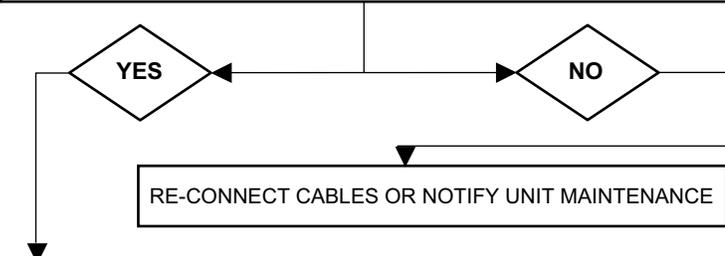
DFCS (cont)	GND/AGD NOT OPERATIONAL/OUT/— —
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NOTE

VERIFY "NO POWER INDICATED ON THE PSP" TROUBLESHOOTING HAS BEEN COMPLETED BEFORE CARRYING OUT PROCEEDING STEPS.

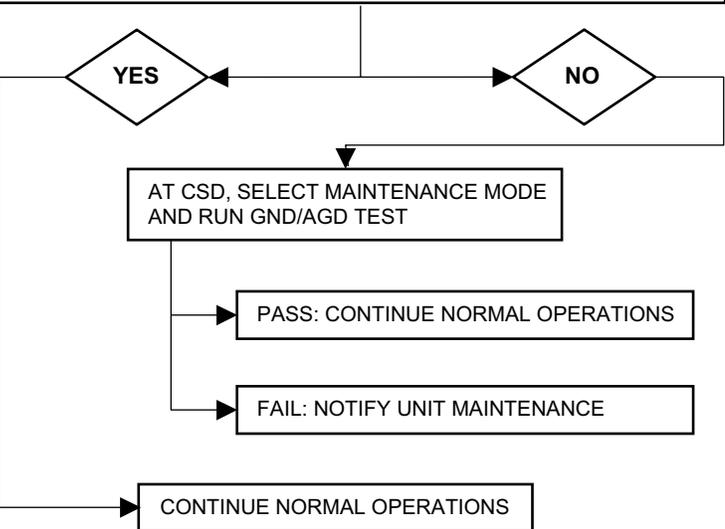
A CHECK CABLES & CONNECTIONS BETWEEN GND [W9] OR AGD [W7] TO MSC.

ARE THE CABLES AND CONNECTIONS SECURE?



B RESET BRANCH CIRCUITS AT PSP BY RAISING TOGGLE SWITCH AND OBSERVE GND/AGD TURNS ON.

WHEN RESETTING BRANCH CIRCUITS AT PSP, DOES THE GND/AGD TURN ON?



TDC0508

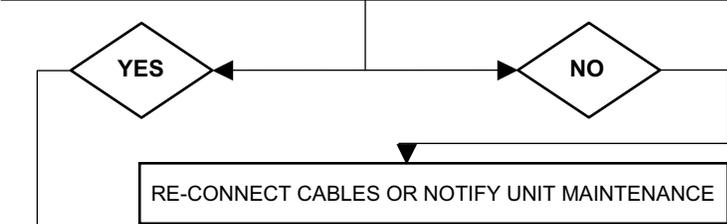
Table 3-1 Troubleshooting (cont)

DFCS (cont)	NAV SYSTEM (PNS/PLGR/VMS) DEGRADED/OUT
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NOTE
VERIFY "NO POWER INDICATED ON THE PSP" TROUBLESHOOTING HAS BEEN COMPLETED BEFORE CARRYING OUT PROCEEDING STEPS.

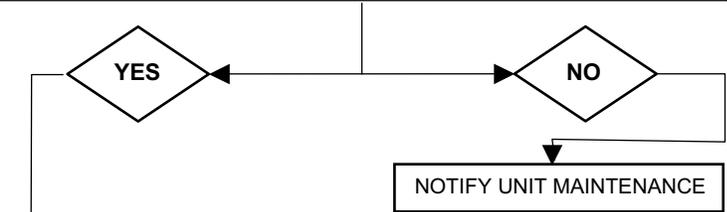
A CHECK CABLES & CONNECTIONS BETWEEN PSP [W6], VMS [W14], PLGR [W8] AND PNS [W8] TO MSC.

ARE THE CABLES AND CONNECTIONS SECURE?



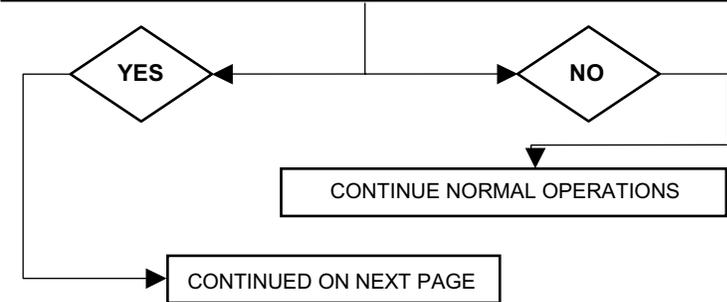
B RESET BRANCH CIRCUITS AT PSP TO RESET POSITION AND OBSERVE MSC TURNS ON.

WHEN RESETTING BRANCH CIRCUITS AT PSP, DOES THE MSC TURN ON?



C CHECK SYSTEM STATUS SCREEN SHOWS NAV SUBSYSTEM DEGRADED.

IS SCREEN SHOWING NAV SUBSYSTEM DEGRADED?

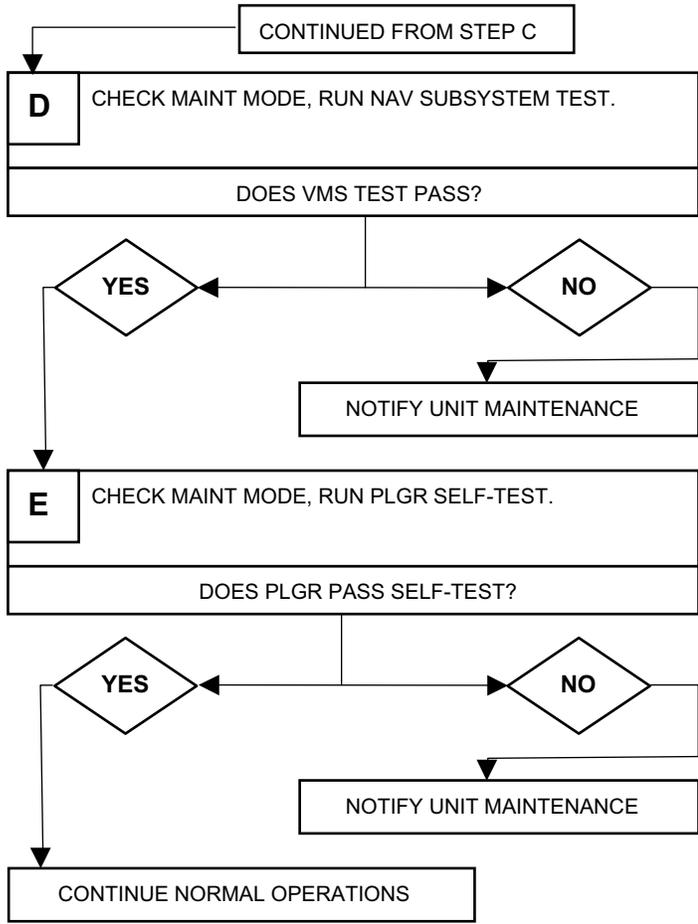


TDC0512

3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

DFCS (cont)	NAV SYSTEM (PNS/PLGR/VMS) DEGRADED/ — — (cont)
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TDC0507

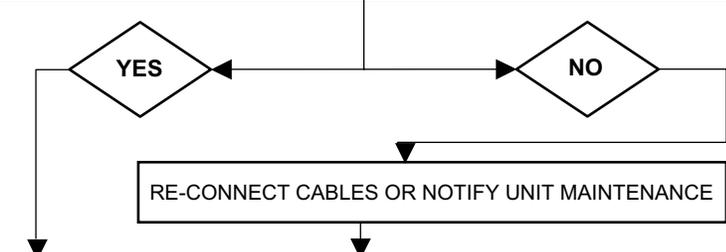
Table 3-1 Troubleshooting (cont)

DFCS (cont)	MSC DEGRADED/OUT
--------------------	------------------

NOTE
 VERIFY "NO POWER INDICATED ON THE PSP" TROUBLESHOOTING HAS BEEN COMPLETED BEFORE CARRYING OUT PROCEEDING STEPS.

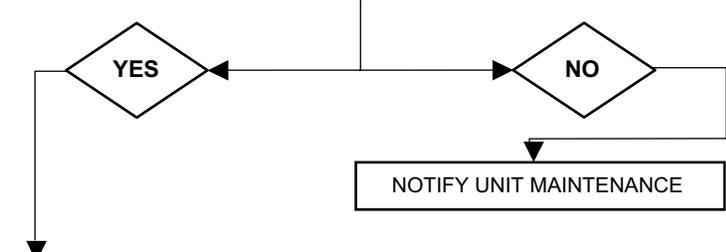
A CHECK CABLES & CONNECTIONS BETWEEN MSC [W6] AND PSP.

ARE THE CABLES AND CONNECTIONS SECURE?



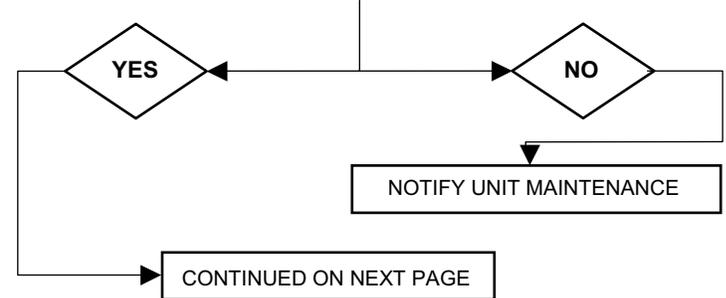
B RESET BRANCH CIRCUITS AT PSP BY RAISING TOGGLE SWITCH AND OBSERVE MSC TURNS ON.

WHEN RESETTING BRANCH CIRCUITS AT PSP, DOES THE MSC TURN ON?



C CHECK SYSTEM STATUS SCREEN SHOWS MSC DEGRADED.

IS SCREEN SHOWING MSC DEGRADED?

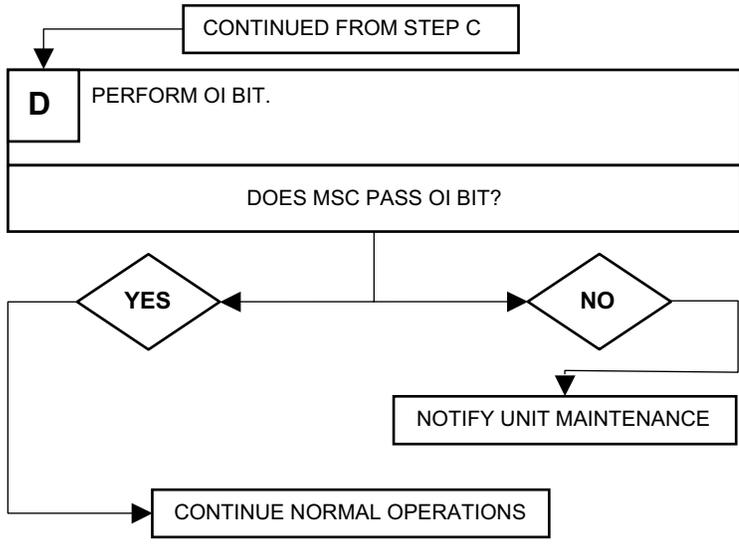


TDC0514

3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

DFCS (cont)	MSC DEGRADED/OUT (cont)
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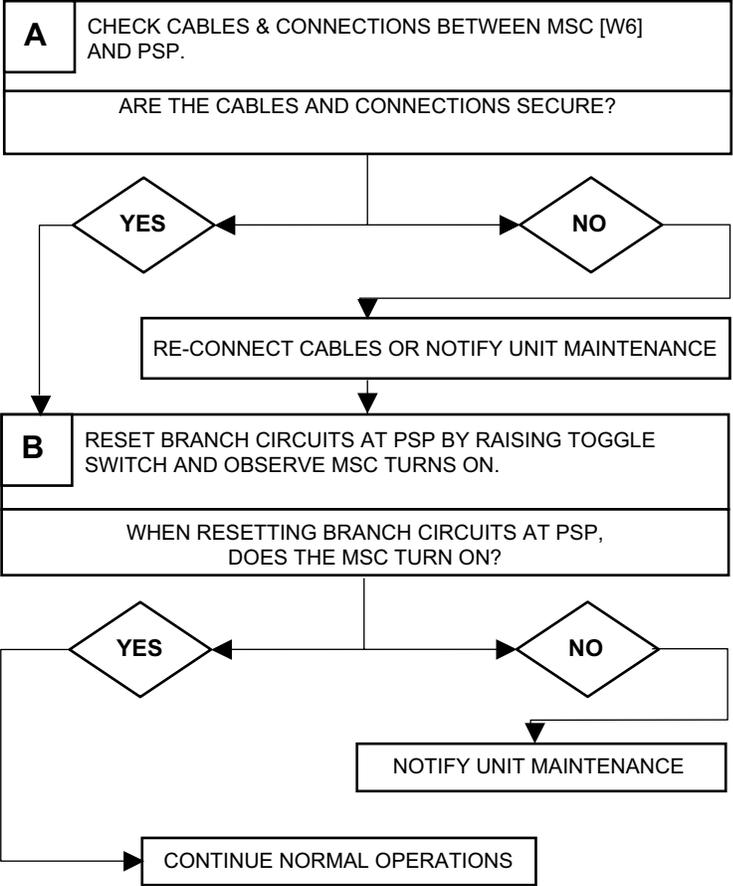
TDC0515

Table 3-1 Troubleshooting (cont)

DFCS (cont)	MSC NOT OPERATIONAL - FAULTY LED DOES NOT ILLUMINATE AT POWER-UP
--------------------	---

NOTE

VERIFY "NO POWER INDICATED ON THE PSP" TROUBLESHOOTING HAS BEEN COMPLETED BEFORE CARRYING OUT PROCEEDING STEPS.



TDC0516

3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

DFCS (cont)	NAV SYSTEM OUT
--------------------	-----------------------

NOTE

VERIFY "NO POWER INDICATED ON THE PSP" TROUBLESHOOTING HAS BEEN COMPLETED BEFORE CARRYING OUT PROCEEDING STEPS.

A CHECK CABLES & CONNECTIONS BETWEEN PNS [W8] AND PSP.

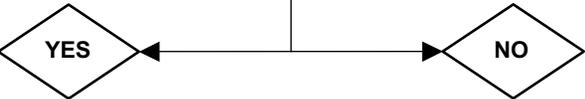
ARE THE CABLES AND CONNECTIONS SECURE?



RE-CONNECT CABLES OR NOTIFY UNIT MAINTENANCE

B RESET BRANCH CIRCUITS AT PSP BY RAISING TOGGLE SWITCH AND OBSERVE MSC TURNS ON.

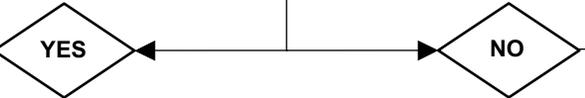
WHEN RESETTING BRANCH CIRCUITS AT PSP, DOES THE MSC TURN ON?



NOTIFY UNIT MAINTENANCE

C CHECK SYSTEM STATUS SCREEN SHOWS NAV SYSTEM OUT.

IS SCREEN SHOWING NAV SYSTEM OUT?

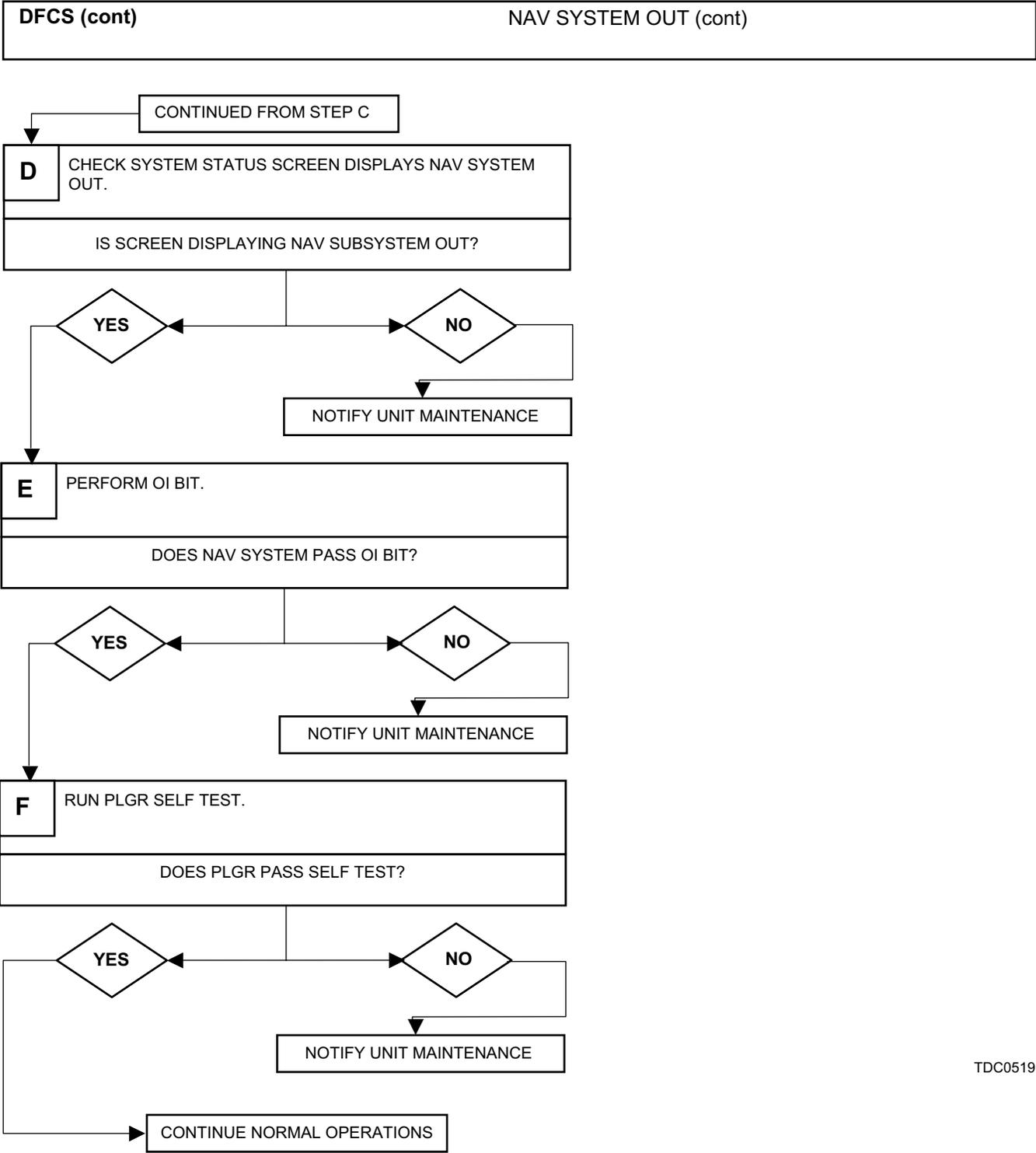


NOTIFY UNIT MAINTENANCE

CONTINUE ON NEXT PAGE

TDC0518

Table 3-1 Troubleshooting (cont)



TDC0519

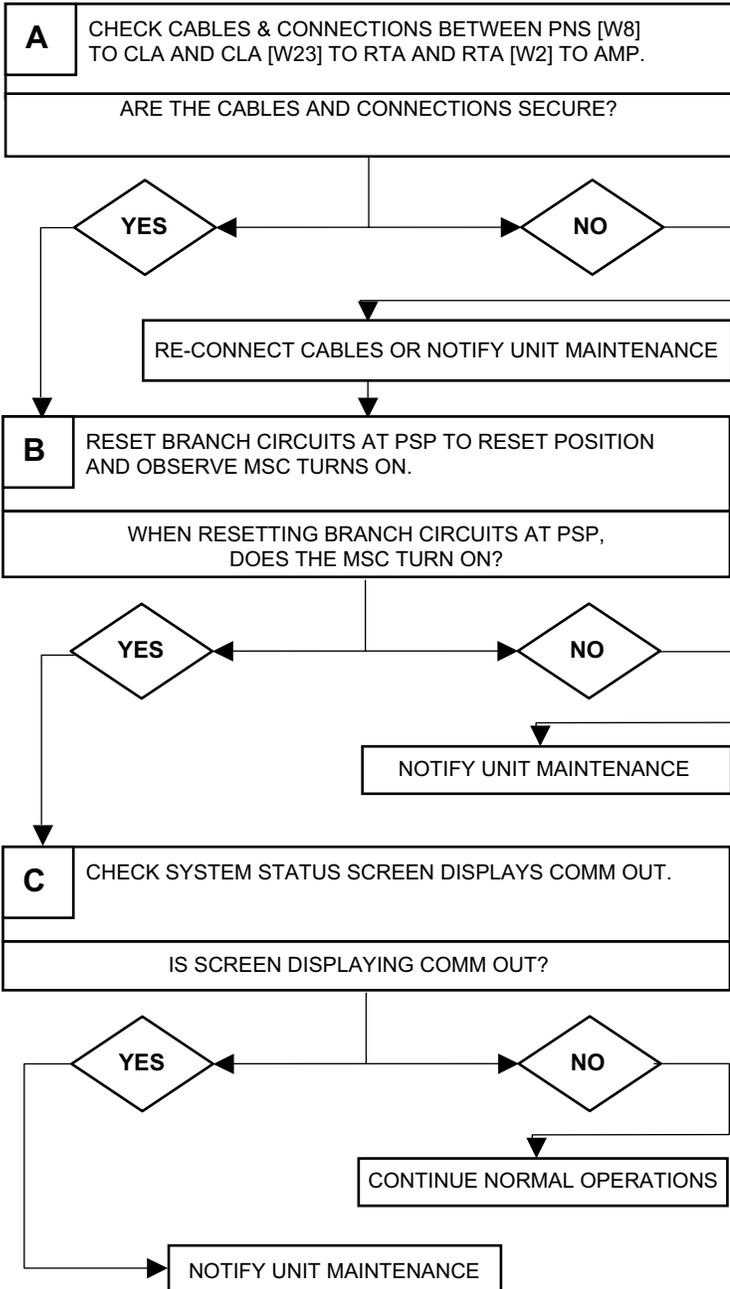
3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

DFCS (cont)	COMM OUT - INDICATED ON PU OR DURING OPERATION
--------------------	--

NOTE

VERIFY "NO POWER INDICATED ON THE PSP" TROUBLESHOOTING HAS BEEN COMPLETED BEFORE CARRYING OUT PROCEEDING STEPS.



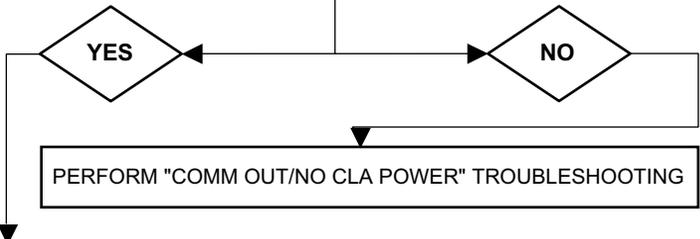
TDC0520

Table 3-1 Troubleshooting (cont)

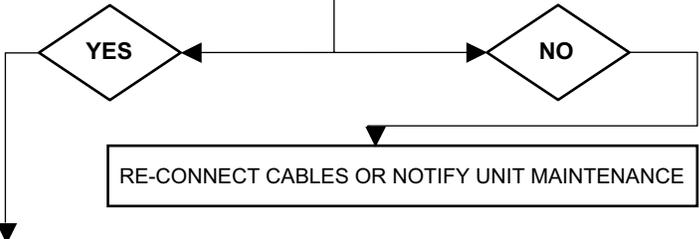
DFCS (cont) NAV SYSTEM DEGRADED - INDICATED ON PU OR DURING OPERATION

NOTE
 VERIFY "NO POWER INDICATED ON THE PSP" TROUBLESHOOTING HAS BEEN COMPLETED BEFORE CARRYING OUT PROCEEDING STEPS.

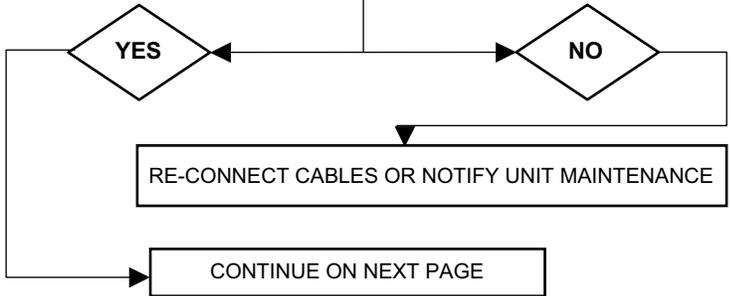
A **PLGR OUT:** CHECK PLGR DISPLAY IS ON.
 IS PLGR DISPLAY ON?



B CHECK CABLES & CONNECTIONS BETWEEN PNS [W8] TO CLA AND MSC.
 ARE THE CABLES AND CONNECTIONS SECURE?



C **VMS OUT:** CHECK CABLES & CONNECTIONS BETWEEN VMS AND WHEEL ARM [W14] MSC.
 ARE CABLES CONNECTED BETWEEN VMS AND ROADARM [W14] TO MSC?

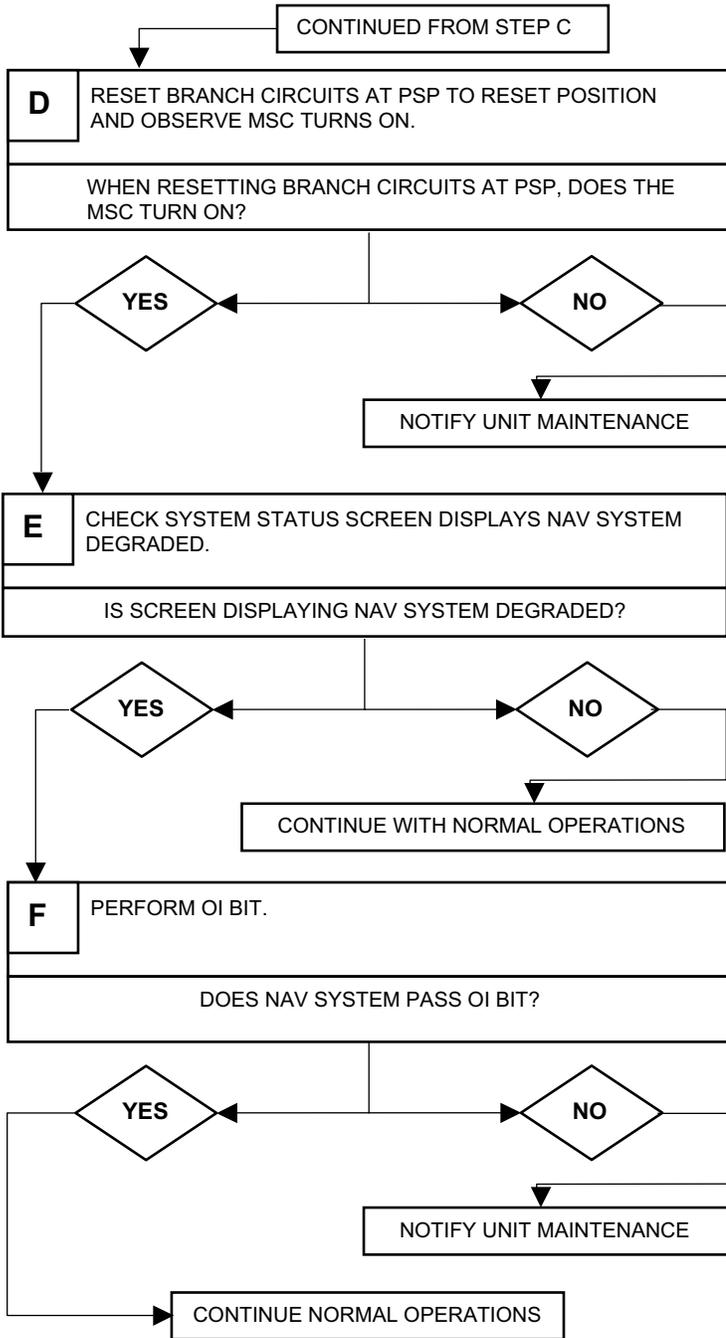


TDC0640

3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

DFCS (cont) NAV SYSTEM DEGRADED - INDICATED ON PU OR DURING OPERATION (cont)



TDC0641

Table 3-1 Troubleshooting (cont)

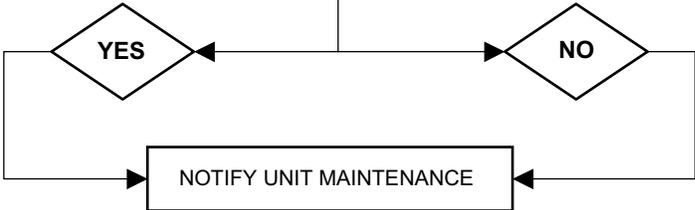
DFCS (cont)	COMM OUT/NO CLA POWER
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NOTE
VERIFY "NO POWER INDICATED ON THE PSP" TROUBLESHOOTING HAS BEEN COMPLETED BEFORE CARRYING OUT PROCEEDING STEPS.

CHECK AND SECURE AS REQUESTED CABLES & CONNECTIONS BETWEEN PSP [W8] AND CLA [W12/W23] AND RTA AND AMP.

RESET BRANCH CIRCUITS BY RAISING TOGGLE SWITCH ON PSP.

A CHECK RTA, PLG AND FAN IS SWITCHED ON.
ARE THE RTA AND PLG DISPLAYS ON?



TDC0529

3-4 TROUBLESHOOTING PROCEDURES (cont)

Table 3-1 Troubleshooting (cont)

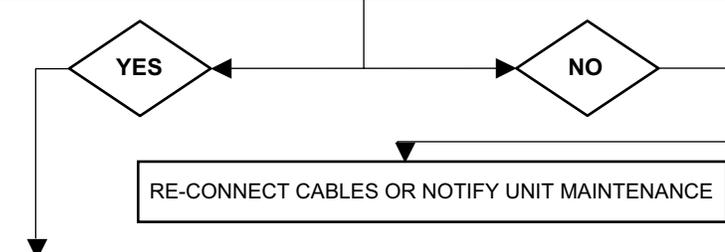
DFCS (cont)	BATTERY NOT CHARGING
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NOTE

VERIFY "NO POWER INDICATED ON THE PSP" TROUBLESHOOTING HAS BEEN COMPLETED BEFORE CARRYING OUT PROCEEDING STEPS.

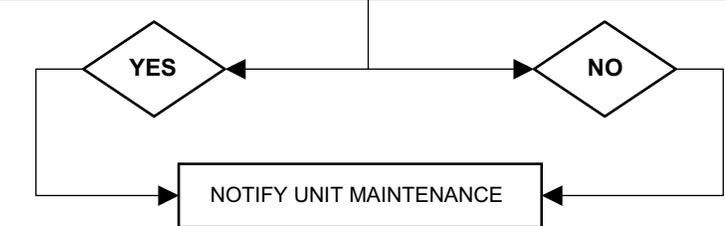
A CHECK CABLES & CONNECTIONS BETWEEN PSP [W5] TO BAT AND BAT [W5/W17] TO BAT.

ARE CABLES CONNECTED BETWEEN PSP [W5] TO BAT AND BAT [W5/W17] TO BAT?



B CHECK DFCS BATTERY HISTORY DATA.

IS DFCS BATTERY HISTORY DATA CORRECT?



TDC0537

Section III. MAINTENANCE PROCEDURES

Section Index

Paragraph	Page
3-5 General.....	3-75

3-5 GENERAL

a. Responsibility. The crew, supervised by the SC, is responsible for corrective maintenance of the howitzer.



BEFORE CARRYING OUT CORRECTIVE MAINTENANCE, ENSURE THAT THE HOWITZER IS NOT LOADED.

- b. Repairs.** Repairs will be limited to those listed in this manual.
- c. Tools.** Appendix B lists tools required to maintain the howitzer.

d. Inspection and Services. Inspect and service according to the following maintenance procedures. The PMCS (Chapter 2, section II) table lists the tasks, which affect operational readiness; perform these tests in the interval indicated. In addition to the PMCS tasks, these procedures include other inspections and services, which do not affect operational readiness, but keep the howitzer in working order.

Section IV. CANNON MAINTENANCE PROCEDURES

Section Index

Paragraph		Page
3-6	Cannon Maintenance.....	3-76
3-7	Breech Mechanism Assembly Maintenance.....	3-77
3-8	Magazine Assembly Maintenance.....	3-100

3-6 CANNON MAINTENANCE

WARNINGS

VERIFY THAT THE WEAPON IS UNLOADED. PERFORMING MAINTENANCE ON A LOADED WEAPON COULD RESULT IN SERIOUS INJURY OR DEATH TO PERSONNEL.

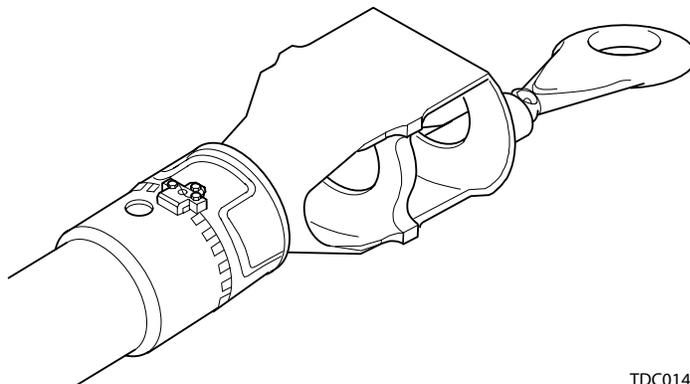
KEEP OUT OF PATH OF RECOILING PARTS. SEVERE CRUSHING INJURIES OR DEATH COULD RESULT.

THE SCAVENGE SYSTEM ISOLATOR VALVE MUST BE CLOSED WHEN WORKING AROUND THE BREECH. FAILURE TO CLOSE THE ISOLATOR VALVE COULD RESULT IN INADVERTENT BREECH MOTION. THIS COULD RESULT IN SEVERE CRUSHING INJURIES TO PERSONNEL.

ENSURE BREECH AND LOADING TRAY LEVERS REFLECT THE CORRECT POSITION OF THEIR COMPONENTS TO PREVENT UNEXPECTED BREECH AND LOADING TRAY MOTION AND POSSIBLE CRUSHING INJURIES TO PERSONNEL.

INSPECTION

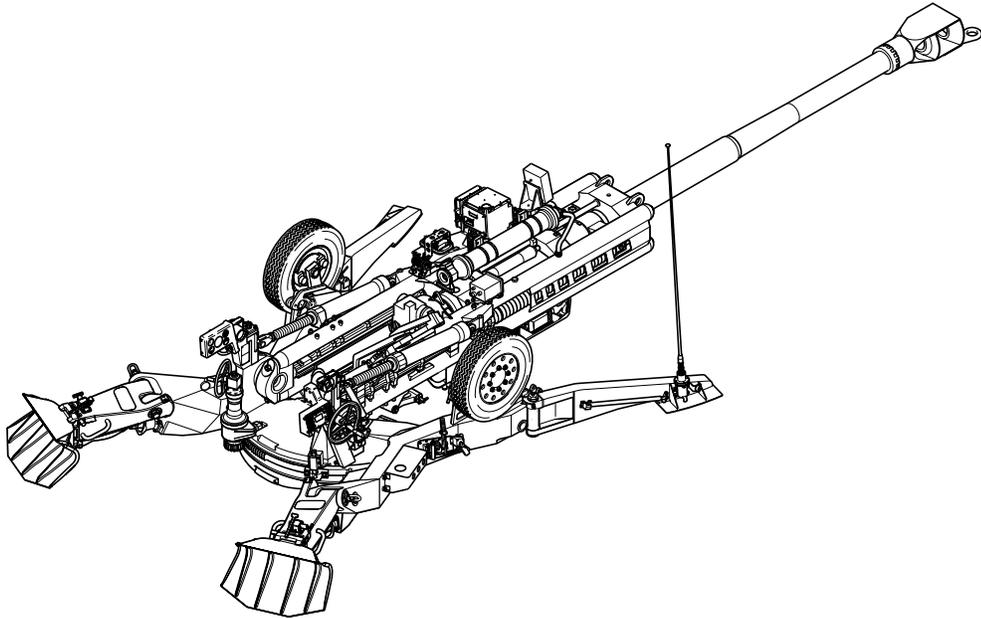
- 1 Inspect Cannon tube for moisture, rust, corrosion, foreign matter, and presence of solid film lubricant. Clean and lubricate (see Sect I, NOTE 1).



TDC0144

NOTE

For nonfiring periods clean and lubricate cannon tube and breech mechanism assembly weekly (see Sect I, NOTE 11).



3-7 BREECH MECHANISM ASSEMBLY MAINTENANCE

NOTE

Disassemble/assemble for cleaning and inspecting only. Crew is authorized to replace firing mechanism.

- 1 Close scavenge isolator valve.
- 2 Manually open breech mechanism (Para 2-25).

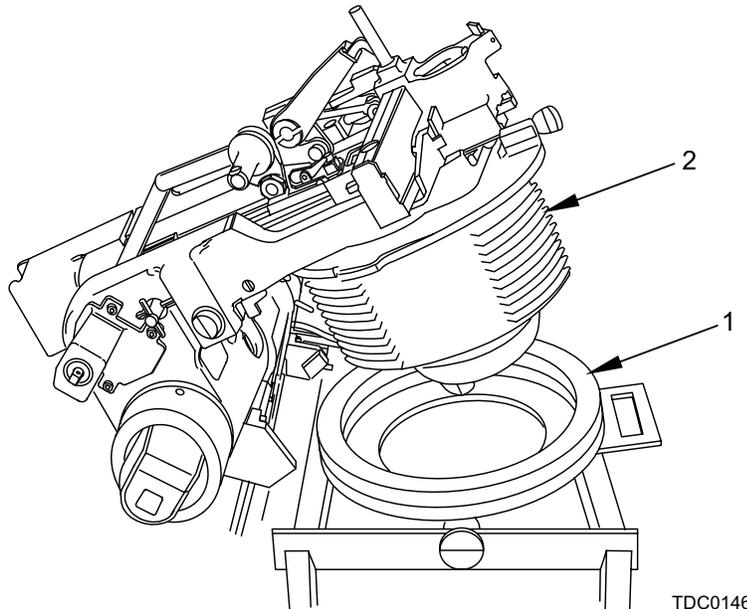
WARNINGS

THE BREECHBLOCK IS HELD IN THE CARRIER BY THE SPINDLE. THE BREECHBLOCK WILL DROP OUT OF THE CARRIER WHEN THE SPINDLE IS REMOVED.

THE BREECHBLOCK MUST BE RESTING ON THE BREECH STOOL BEFORE THE SPINDLE IS REMOVED. FAILURE TO USE THE BREECH STOOL COULD RESULT IN SERIOUS INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT.

3-7 BREECH MECHANISM ASSEMBLY MAINTENANCE (cont)

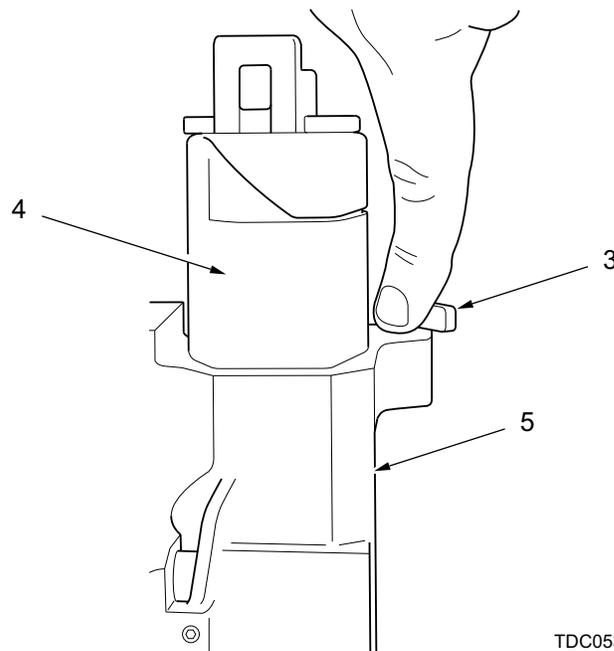
- 3 Place the breech stool (1) onto the recoil slides. Move the stool forward until it is centered under the breechblock assembly (2).
- 4 Manually lower breech mechanism (2) onto center of breech stool (1).



a. M54 Firing Mechanism

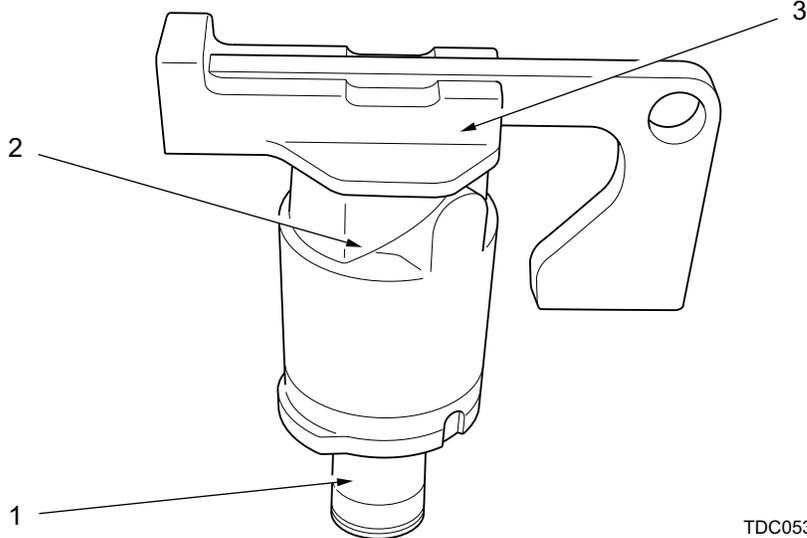
REMOVAL

- 1 Depress block plunger (3) and rotate M54 firing mechanism (4) CW until the lugs disengage from cutouts in the tray assembly (5). Lift mechanism out of the tray assembly.



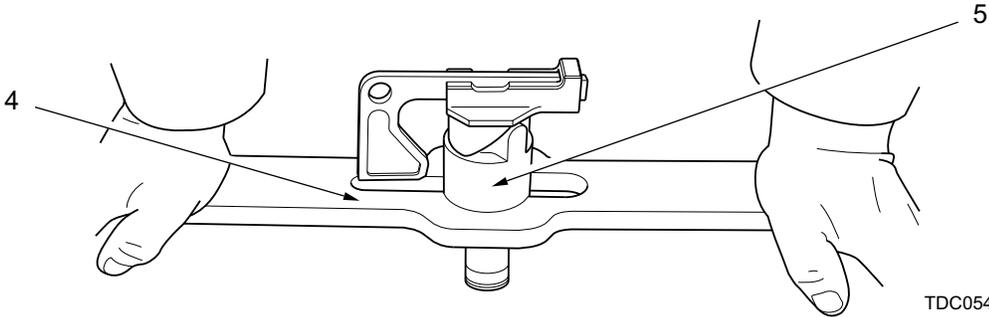
DISASSEMBLE

- 1 Place 17mm socket (1) on a firm hard surface, place M54 firing mechanism (2) on top off 17mm socket with follower (3) end up.



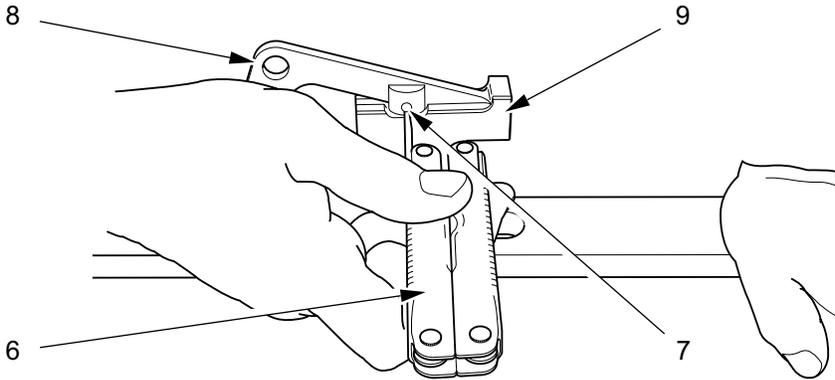
TDC0539

- 2 Place FM wrench (4) onto case (5). Using wrench, depress assembly.



TDC0540

- 3 Using multi-tool (6), remove pin (7), lanyard lever (8) and follower (9).



TDC0541

3-7 BREECH MECHANISM ASSEMBLY MAINTENANCE (cont)

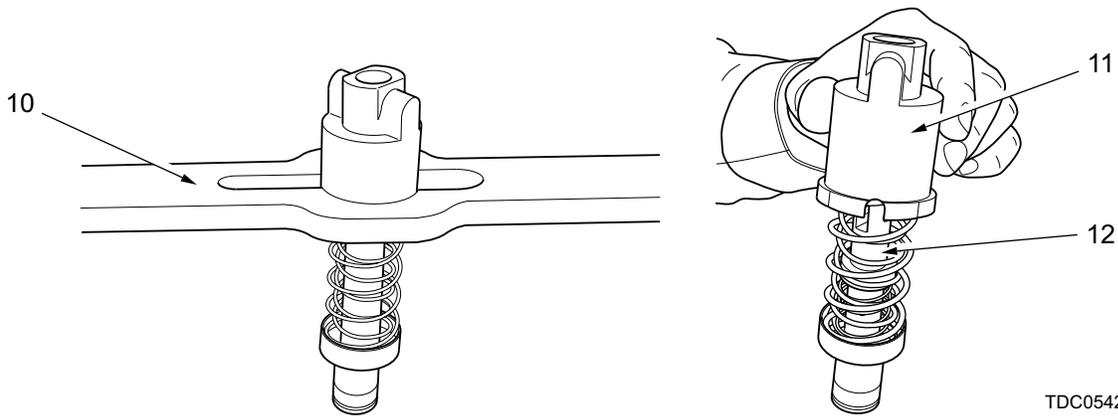
a. M54 Firing Mechanism (cont)

DISASSEMBLE (cont)

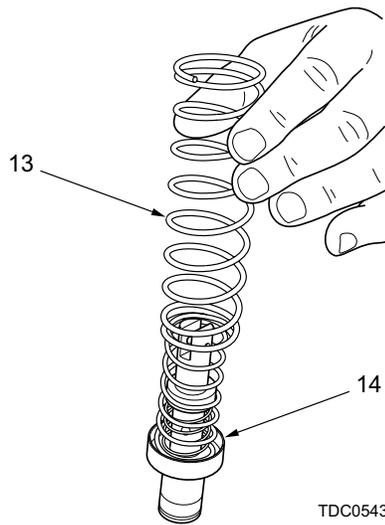
WARNING

M54 FIRING MECHANISM ASSEMBLY IS UNDER PRESSURE. WHEN REMOVING PIN, ENSURE PRESSURE IS APPLIED TO FIRING MECHANISM WRENCH. FAILURE TO DO SO MAY CAUSE INJURY TO PERSONNEL.

- 4 Under control allow case and springs to expand.
- 5 Remove FM wrench (10) from case (11) then remove case from cup and yoke springs (12).



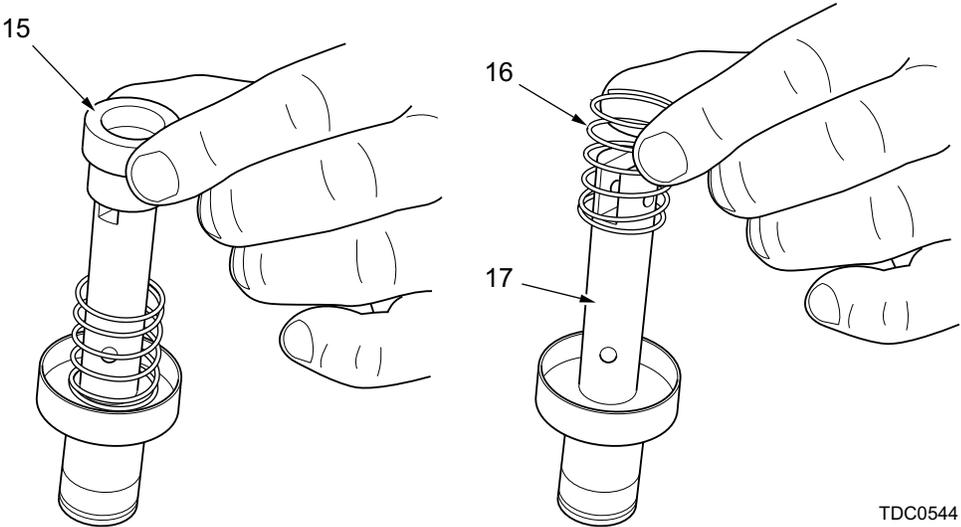
- 6 Remove cup and yoke springs (13) from yoke assembly (14).



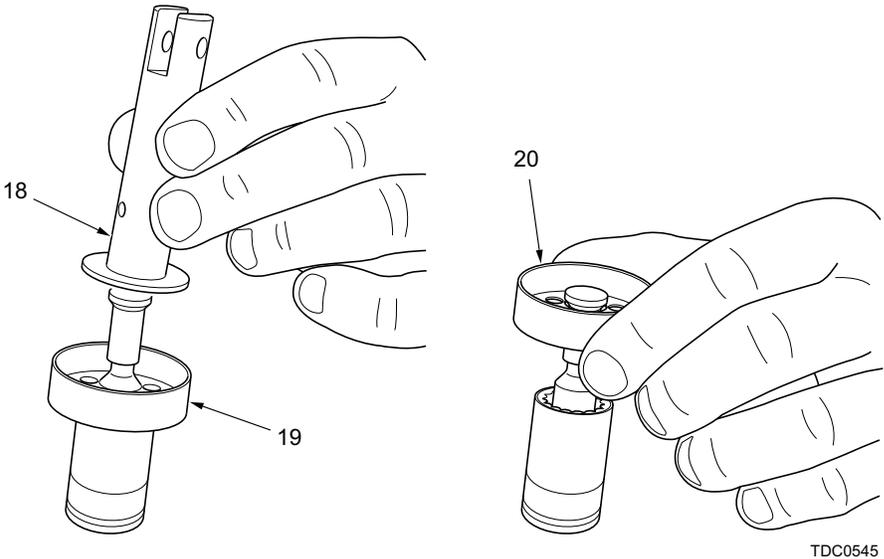
NOTE

Take care when removing sleeve (15) and sleeve spring (16) from yoke (17), balls are loose and may detach from yoke assembly.

- 7 Remove sleeve (15) and sleeve spring (16) from yoke (17).



- 8 Lift and remove yoke (18) from firing hammer (19). Carefully remove three balls.
- 9 Remove cup (20) from firing hammer (19).

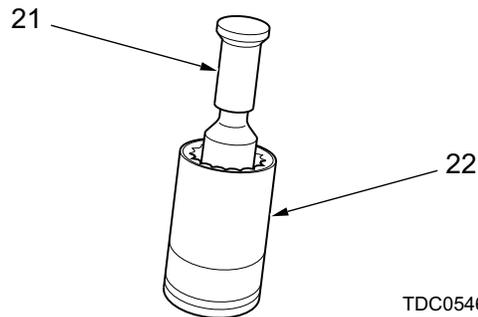


3-7 BREECH MECHANISM ASSEMBLY MAINTENANCE (cont)

a. M54 Firing Mechanism (cont)

DISASSEMBLE (cont)

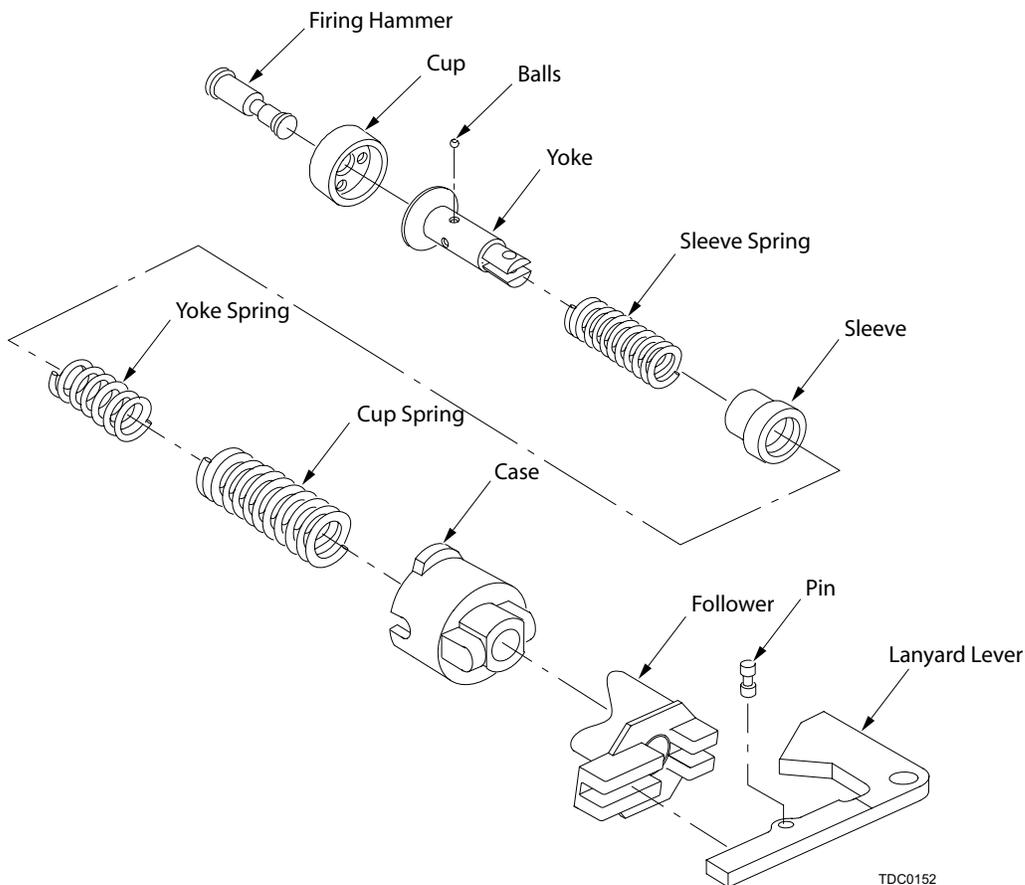
- 10 Remove firing hammer (21) from 17mm socket (22).



TDC0546

SERVICE AND INSPECTION

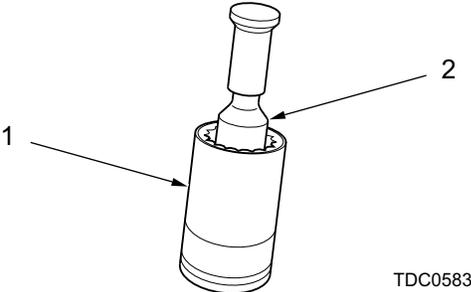
- 1 Clean and lubricate all parts with CLP (item 7, appx D) (Sect I, NOTE 7).
- 2 Remove corrosion, burrs from M54 firing mechanism with CLP (item 7, appx D), hand file and crocus cloth (item 11, appx D), remove excess CLP with clean wiping rag (item 29, appx D).



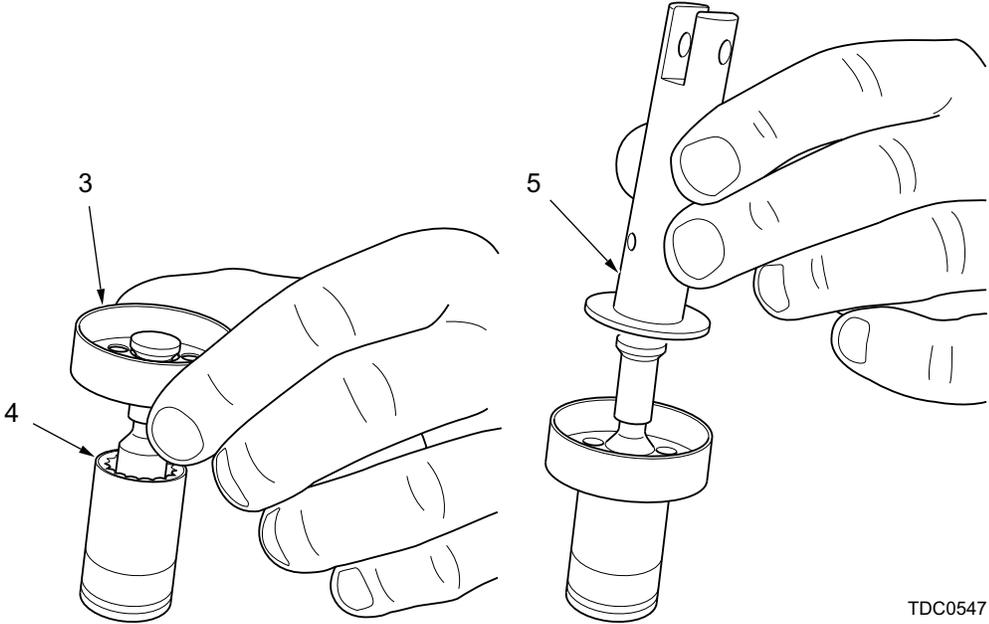
TDC0152

ASSEMBLE

- 1 Place 17mm socket (1) on a firm hard surface put firing hammer (2) inside socket.



- 2 Place cup (3) onto firing hammer (4), then slide yoke (5) onto hammer until seated.



NOTE

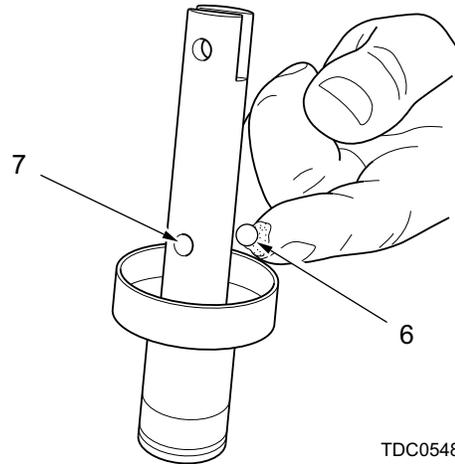
Use WTR (item 16/17, appx D) grease to hold balls into yoke holes.

- 3 Apply WTR (item 16/17, appx D) grease to three balls (6) and install balls into yoke holes (7).

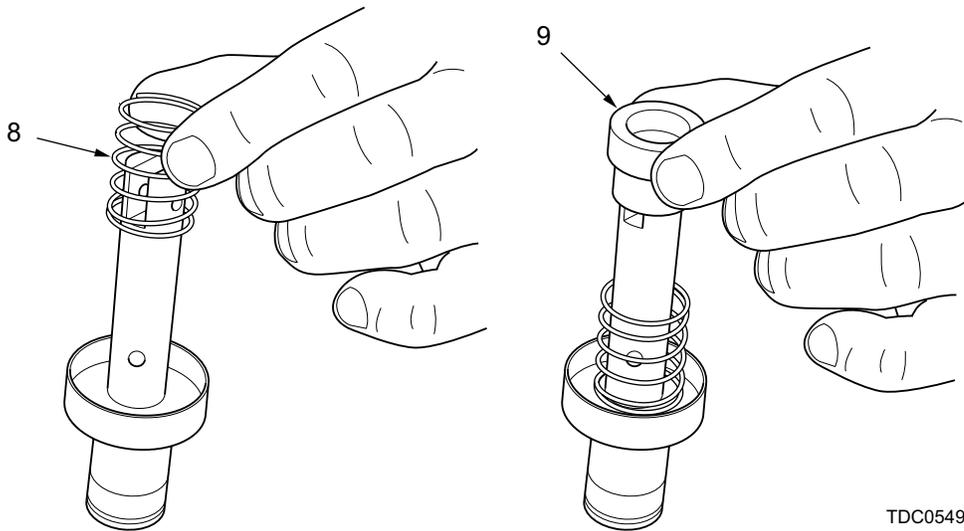
3-7 BREECH MECHANISM ASSEMBLY MAINTENANCE (cont)

a. M54 Firing Mechanism (cont)

ASSEMBLE (cont)



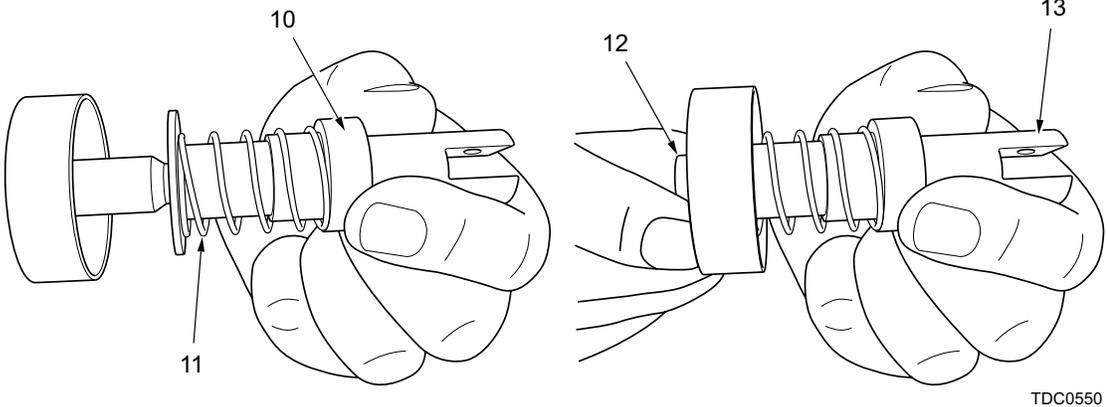
- 4 Slide sleeve spring (8) and sleeve (9) onto firing hammer.



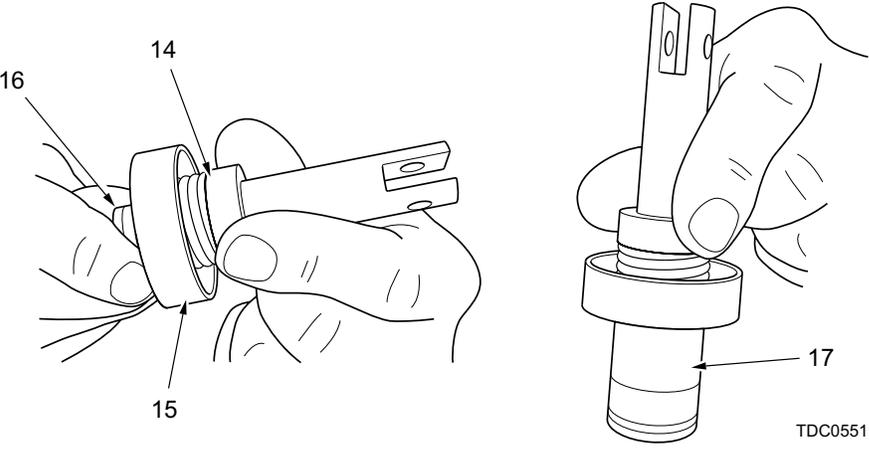
NOTE

When removing yoke assembly from 17mm socket, ensure pressure is applied to the sleeve spring and sleeve.

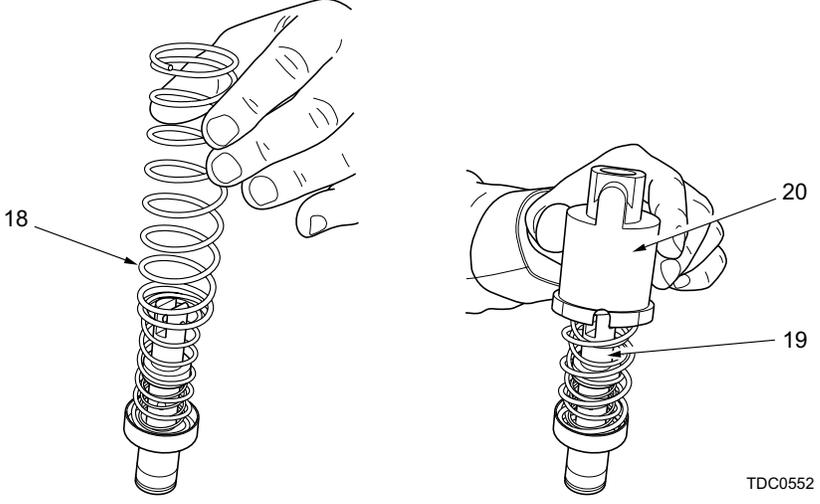
- 5 Hold sleeve (10) and sleeve spring (11) and remove assembly from 17mm socket.
6 Slide firing hammer (12) into yoke (13) (towards sleeve), until balls fall into hammer groove.



- 7 Fully compress sleeve and sleeve spring (14) towards cup (15), then pull firing hammer (16) outwards. Ensure sleeve and sleeve spring is locked.
- 8 Place assembly onto 17mm socket (17).



- 9 Slide yoke and cup springs (18) onto yoke (19).
- 10 Place case (20) over springs.

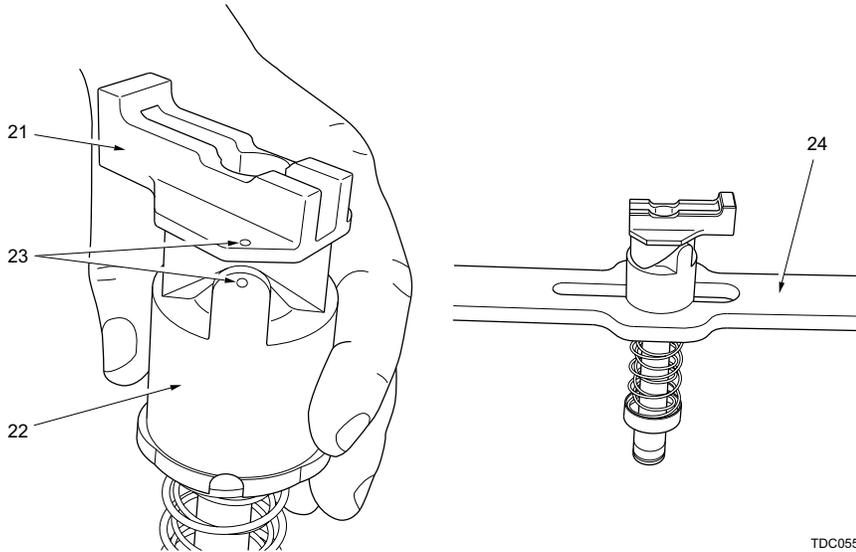


3-7 BREECH MECHANISM ASSEMBLY MAINTENANCE (cont)

a. M54 Firing Mechanism (cont)

ASSEMBLE (cont)

- 11 Place follower (21) over case (22), ensuring witness marks (23) are aligned.
- 12 Slide FM wrench (24) onto case (22).

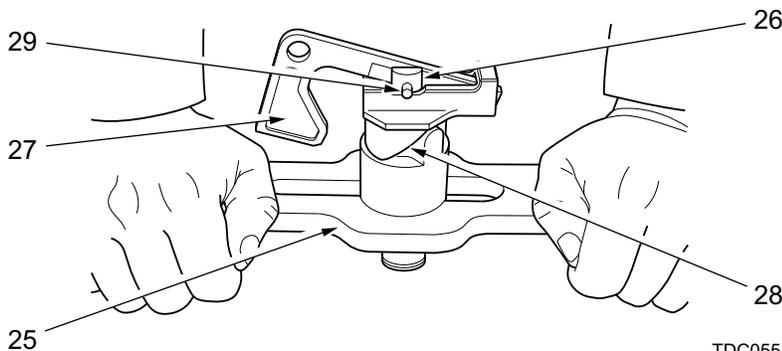


TDC0553

WARNING

WHEN INSERTING PIN, ENSURE CONTINUOUS PRESSURE IS APPLIED TO FIRING MECHANISM WRENCH UNTIL PIN IS INSTALLED. FAILURE TO DO SO MAY CAUSE INJURY TO PERSONNEL.

- 13 Using FM wrench (25) compress springs until yoke hole (26) is visible.
- 14 Install lanyard lever (27) into follower (28) and yoke, and align holes.
- 15 Install pin (29) into yoke hole (26). Ensure pin is secure.
- 16 Carefully release pressure and remove FM wrench from M54 firing mechanism.



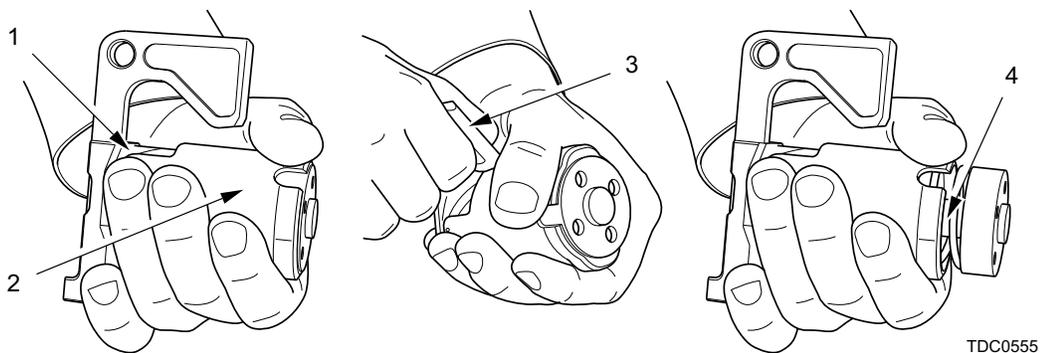
TDC0554

b. M54 Firing Mechanism – Functional Test

WARNING

KEEP HANDS AWAY FROM BOTTOM OF M54 FIRING MECHANISM WHEN CARRYING OUT THE FUNCTIONAL TEST; FAILURE TO DO SO MAY CAUSE INJURY TO PERSONNEL.

- 1 Hold M54 firing mechanism (1) by the case (2), pull lanyard lever (3) (an audible click should be heard) until firing hammer and cup have recessed case.
- 2 Push cup and hammer (4) back into case, ensuring M54 firing mechanism re-cocks. Repeat test (if necessary).



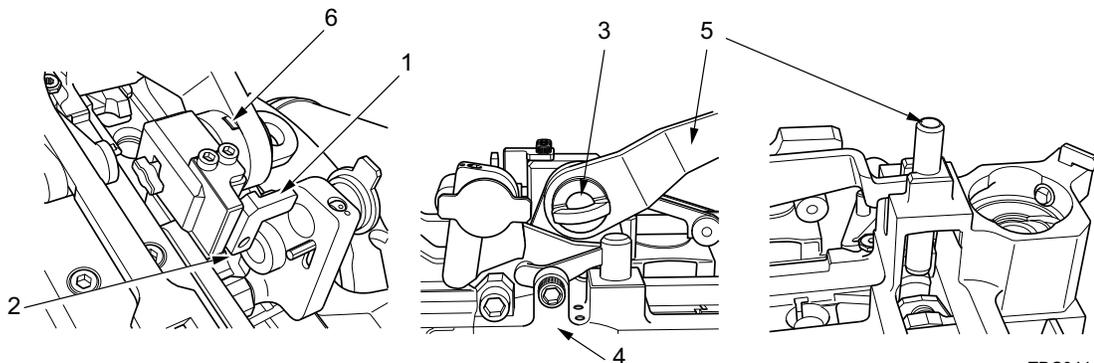
NOTE

If functional test fails, repeat disassembly and assembly (Para 3-7a.) steps. If mechanism fails functional test, notify unit maintenance.

c. Injector Arm Assembly

REMOVAL

- 1 Push and rotate knob (1), 90°CCW, until knob is on knob stop (2).
- 2 Rotate locking shaft (3) 90° and remove from tray assembly (4).
- 3 Remove injector arm assembly (5) from slots on follower (6).
- 4 Re-install locking shaft (3) by rotating 90° until engaged.



3-7 BREECH MECHANISM ASSEMBLY MAINTENANCE (cont)

c. Injector Arm Assembly (cont)

SERVICE AND INSPECTION

- 1 Clean and remove corrosion from injector arm assembly with CLP (item 7, appx D) and crocus cloth (item 11, appx D), remove excess CLP with clean wiping rag (item 29, appx D).
- 2 If burring has occurred, notify unit maintenance.

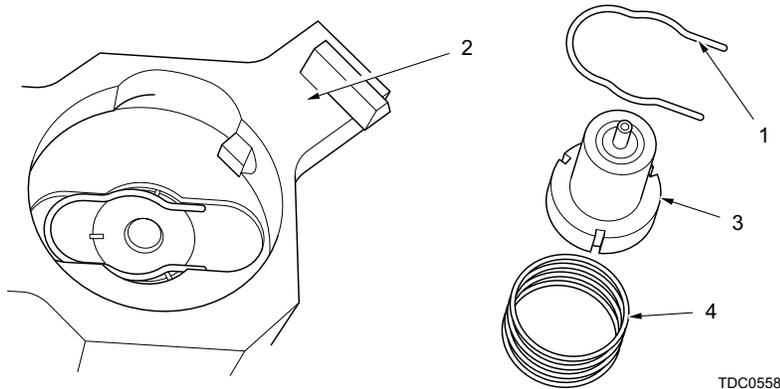
d. Firing Pin

REMOVAL

WARNING

FIRING PIN RETAINER AND FIRING PIN ARE UNDER COMPRESSION. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN INJURY TO PERSONNEL.

- 1 Using multi-tool, pry firing pin retainer (1) out of the tray assembly (2). Remove firing pin (3) and spring (4).



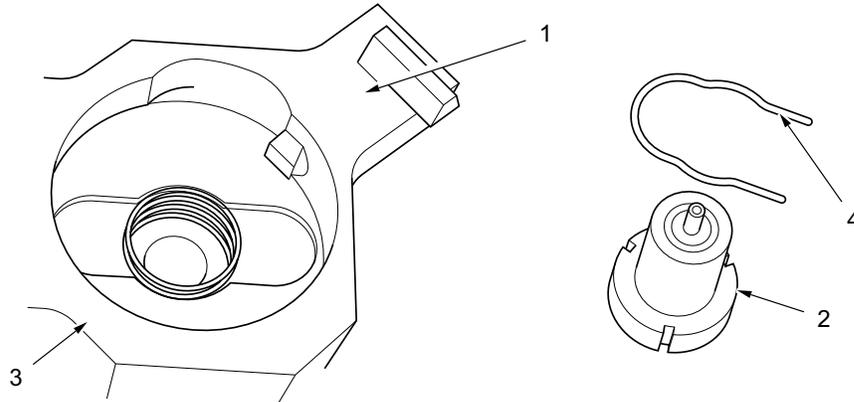
TDC0558

SERVICE AND INSPECTION

- 1 Clean and remove corrosion from firing pin, retainer, spring and cavity with CLP (item 7, appx D) and crocus cloth (item 11, appx D), remove excess CLP with clean wiping rag (item 29, appx D).
- 2 If burring has occurred in cavity, remove burrs using hand file.
- 3 Replace firing pin if the tip is deformed, bent or broken.
- 4 Replace firing pin retainer if it is kinked or otherwise deformed.
- 5 Replace firing pin spring if it is kinked or broken.

INSTALLATION

- 1 Insert spring (1) and firing pin (2) into the firing pin cavity of the tray assembly (3). Using multi-tool, push firing pin retainer (4) into the groove. Push the firing pin to verify that it moves freely.

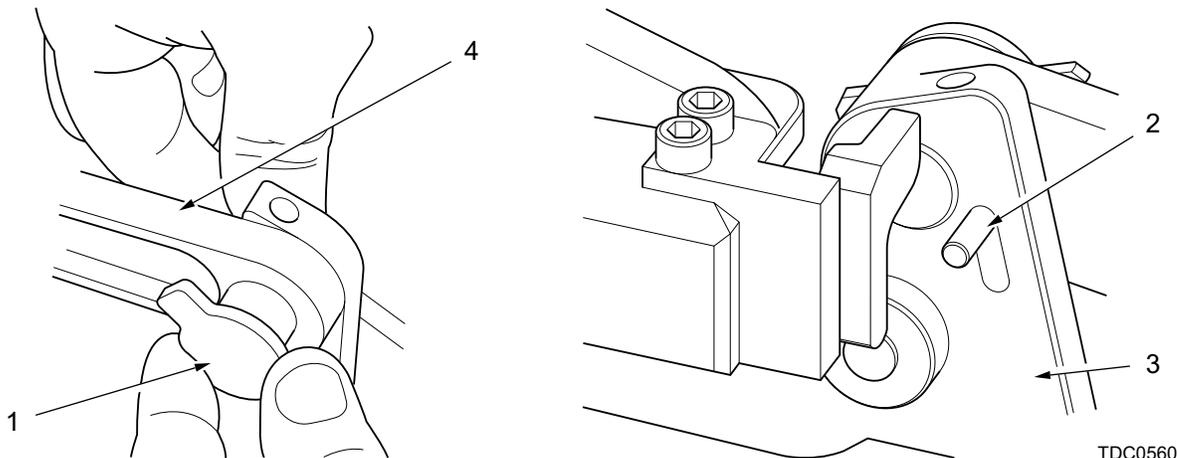


TDC0559

e. Tray Assembly

REMOVAL

- 1 Disengage quick release assembly (1) by pushing pin (2) on the drive link assembly (3) rearwards. Remove connector link (4).
- 2 Rotate quick release assembly (1) away from the drive link assembly (3). Re-install connector link (4).



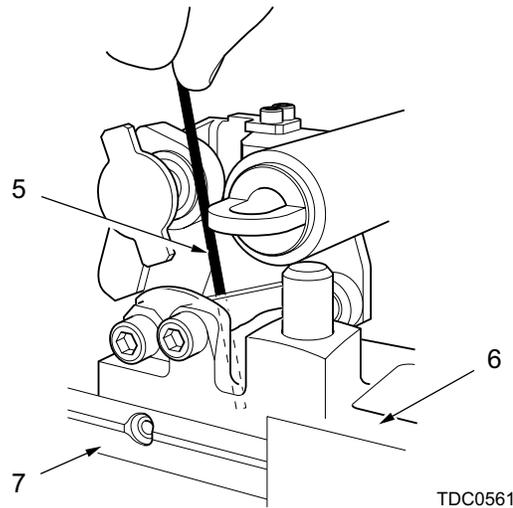
TDC0560

3-7 BREECH MECHANISM ASSEMBLY MAINTENANCE (cont)

e. Tray Assembly (cont)

REMOVAL (cont)

- 3 Using multi-tool (5) depress locking plunger and slide tray assembly (6) from body assembly (7).



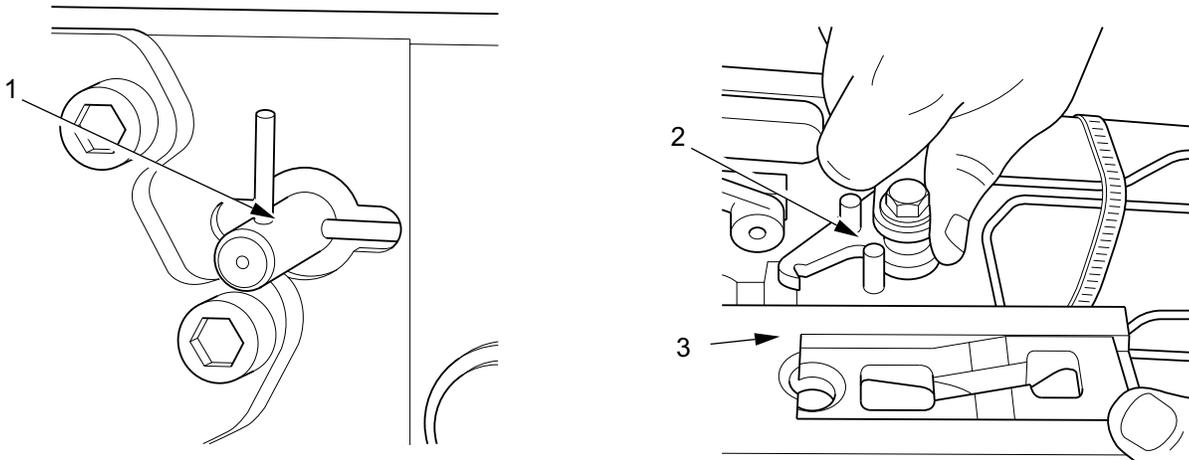
SERVICE AND INSPECTION

- 1 Clean and remove corrosion and small burrs from rails with CLP (item 7, appx D), crocus cloth (item 11, appx D) and hand file. Remove excess CLP with clean wiping rag (item 29, appx D).

f. Body Assembly

REMOVAL

- 1 Pull the primer feed lock (1) out and rotate 45° CCW. Rotate latch (2) CW, slide and lift body assembly (3) out of the carrier assembly.



SERVICE AND INSPECTION

- 1 Clean and remove corrosion and small burrs from guides with CLP (item 7, appx D), crocus cloth (item 11, appx D) and hand file. Remove excess CLP with clean wiping rag (item 29, appx D).

g. Spindle Assembly

REMOVAL

WARNINGS

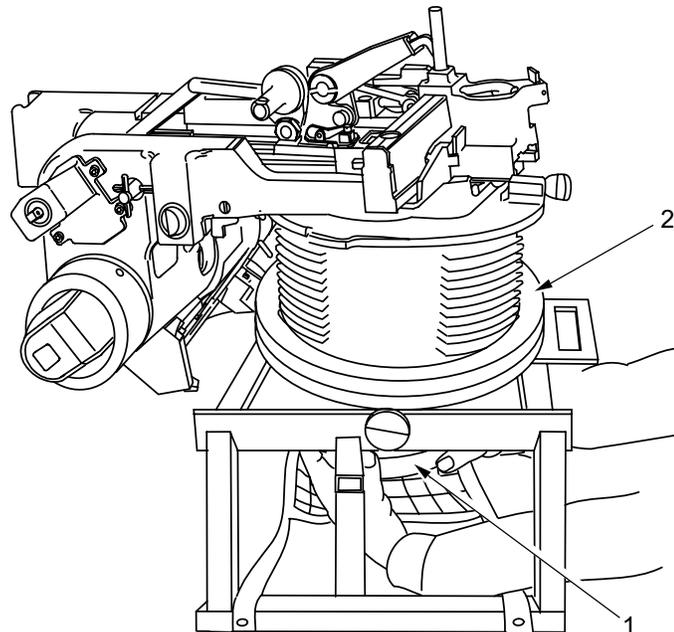
WHEN DISENGAGING SPINDLE FROM CARRIER, SPINDLE MAY DROP SUDDENLY CAUSING INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT.

DO NOT RAISE THE BREECHBLOCK ASSEMBLY OFF THE BREECH STOOL WHEN THE SPINDLE ASSEMBLY IS REMOVED. CAUSING SEVERE INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT.

NOTE

Ensure disc is removed from breechblock assembly.

- 1 Lift and rotate spindle assembly (1) CW and lower the spindle through the hole in the center of the breech stool (2). Set the spindle on a clean level surface. Ensure disc is removed from breechblock.



TDC0166

CAUTION

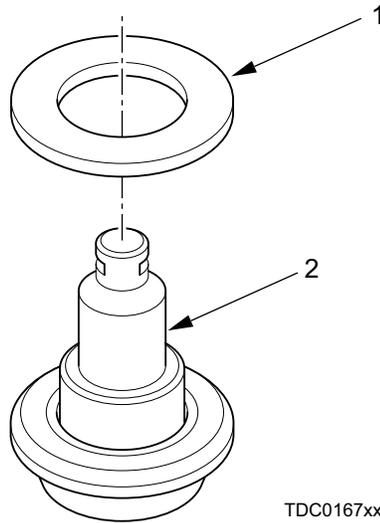
Care should be taken when removing obturator pad.

3-7 BREECH MECHANISM ASSEMBLY MAINTENANCE (cont)

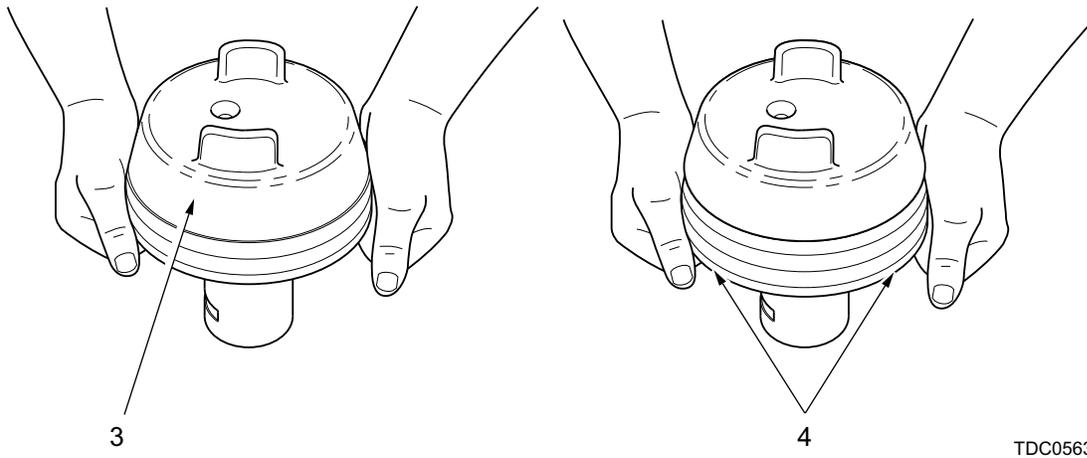
g. Spindle Assembly (cont)

DISASSEMBLE

- 1 Remove disc (1) from spindle (2).



- 2 With spindle (3) on a firm flat surface, remove obturator by applying equal pressure to opposite sides of obturator (4).



SERVICE AND INSPECTION

CAUTION

Do not clean obturator pad with CLP (item 7, appx D), or expose pad to high water pressure. Damage may occur to pad.

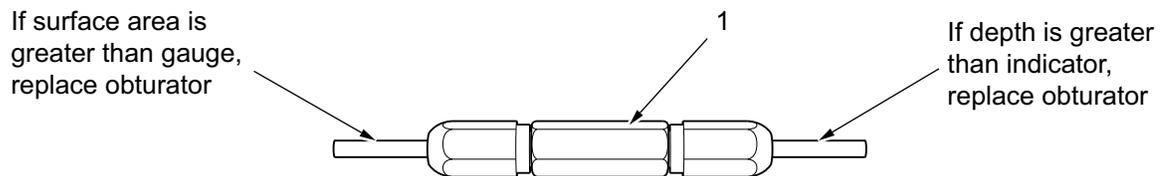
- 1 Using a scouring pad (item 22, appx D), clean obturator pad with water. Dry pad with clean wiping rags (item 29, appx D).

- Using obturator gauge (1), inspect obturator pad as follows:

NOTE

Two types of obturator pad are used; a non-mesh type and a mesh type. If using the non-mesh type, proceed to step 3., if using the mesh type, proceed to step 4.

- Using go/no go gauge, test and inspect obturator pad for damage and/or wear. If obturator fails go/no go test and inspection, replace obturator pad and notify unit maintenance.

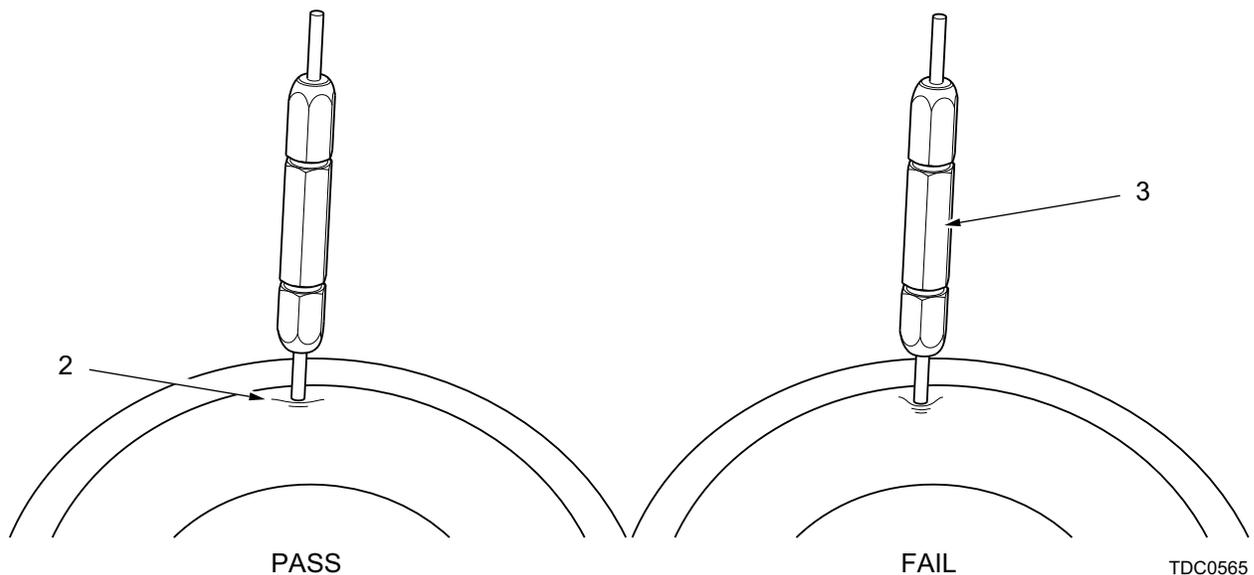


TDC0564

- Inspect obturator pad (2) for gouges. If gouges present, place obturator gauge (3) in split ring area and check depth and surface area.

NOTE

If surface area and/or depth of the gouge exceeds surface area and/or depth on gauge, replace obturator.



TDC0565

NOTE

If steel mesh is visible but not torn, obturator pad is still serviceable.

- Check obturator pad for damage or wear, if steel mesh is visible and torn, replace
- Clean and remove corrosion from spindle assembly and disc with CLP (item 7, appx D), crocus cloth (item 11, appx D), remove excess CLP with a clean wiping rag (item 29, appx D).
- If cracks, pitting, burrs are present or any evidence of blowby (erosion into the steel), notify unit maintenance.

3-7 BREECH MECHANISM ASSEMBLY MAINTENANCE (cont)

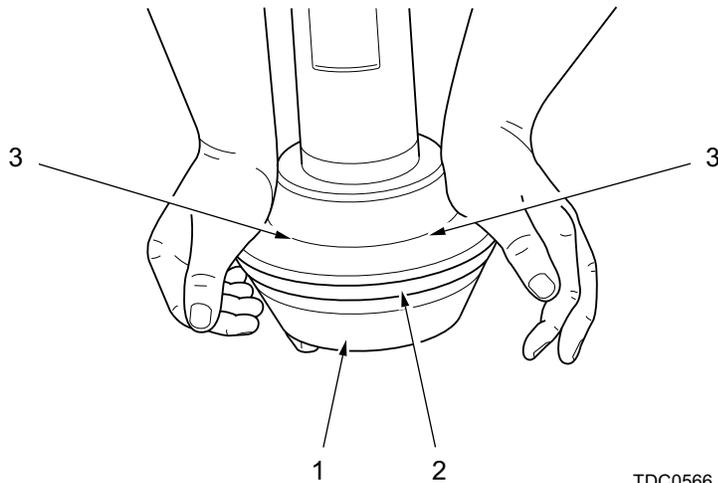
g. Spindle Assembly (cont)

ASSEMBLE

NOTE

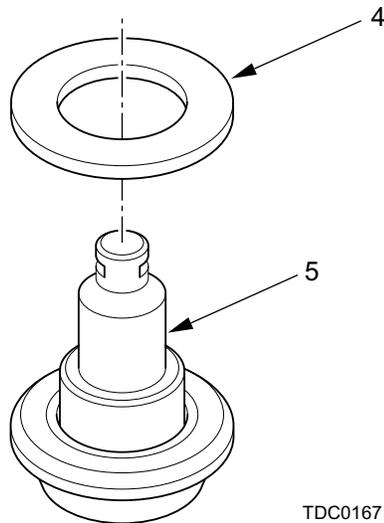
Care should be taken when installing obturator pad.

- 1 With the spindle (1) on a firm flat surface, install obturator pad (2) by applying equal pressure on opposite sides of obturator (3).



TDC0566

- 2 Install disc (4) onto the spindle (5).



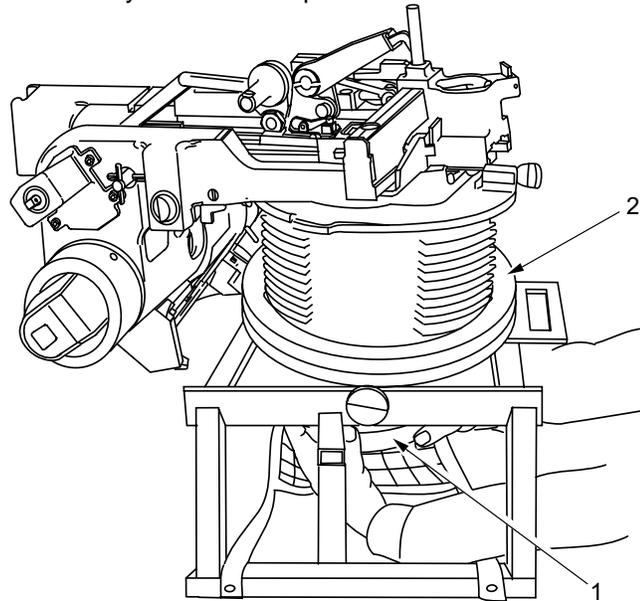
TDC0167

INSTALLATION

NOTE

Apply light coat of WTR (item 16/17, appx D) to top of disc before installation.

- 1 Raise spindle assembly (1) through hole in the center of breech stool (2) and install the spindle into the breechblock assembly. Rotate the spindle CCW to lock into the breechblock.



TDC0166

h. Separating Breechblock and Carrier Assemblies

NOTE

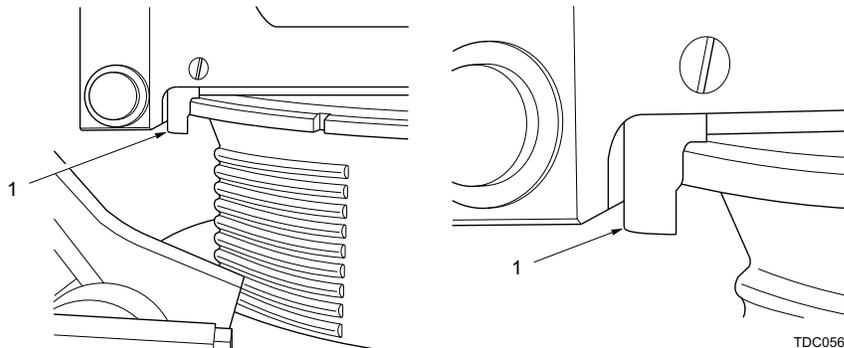
During normal operations and conditions, separating breechblock and carrier assemblies is a weekly task.

REMOVAL

WARNING

TAKE CARE WHEN ROTATING BREECHBLOCK WHEN APPLYING FINGER PRESSURE TO DETENT PLUNGER. FAILURE TO DO SO MAY CAUSE INJURY TO PERSONNEL.

- 1 Depress breechblock detent plunger (1). With plunger depressed, using trunnion pump handle manually rotate breechblock CW to the closed position (until witness marks on the breechblock are aligned with the witness marks on the carrier).



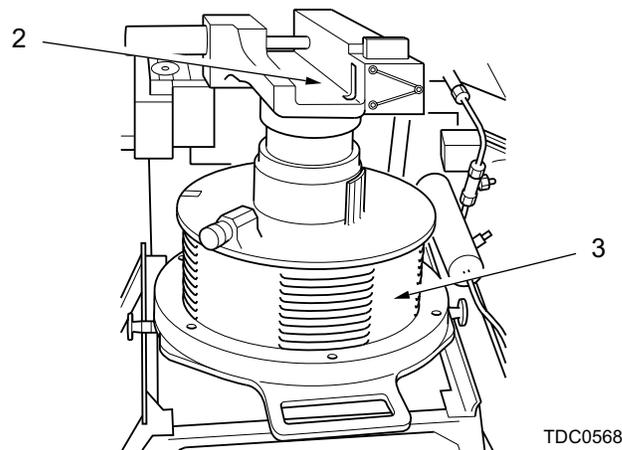
TDC0567

3-7 BREECH MECHANISM ASSEMBLY MAINTENANCE (cont)

h. Separating Breechblock and Carrier Assemblies (cont)

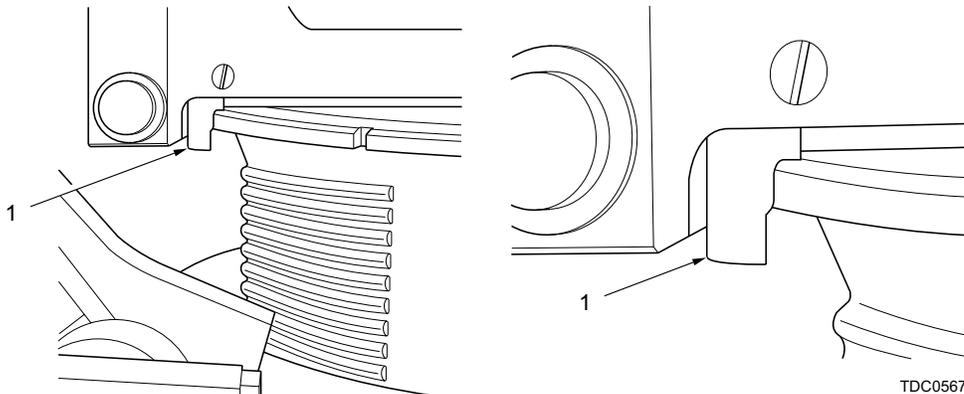
REMOVAL (cont)

- 2 Remove Spindle Assembly (Para 3-7g).
- 3 Separate carrier (2) and breechblock (3) assemblies, by moving breech lever to the OPEN position. Insert pump handle into trunnion adaptor, pump back and forth on handle until carrier is raised to the fully open position (carrier will separate from breechblock).



SERVICE AND INSPECTION

- 1 Remove existing grease with a clean dry rag.
- 2 Inspect carrier breechblock boss (1) and breechblock gear for corrosion, pitting or burrs.



- 3 If corrosion is present, clean with CLP (item 7, appx D) and crocus cloth (item 11, appx D). Wipe dry with a clean wiping rag (item 29, appx D).
- 4 If burrs are present, remove with hand file.
- 5 Apply a thick coat of WTR (item 16/17, appx D) to breechblock boss (1) and gear (2).

NOTE

Ensure carrier witness marks aligns with carrier.

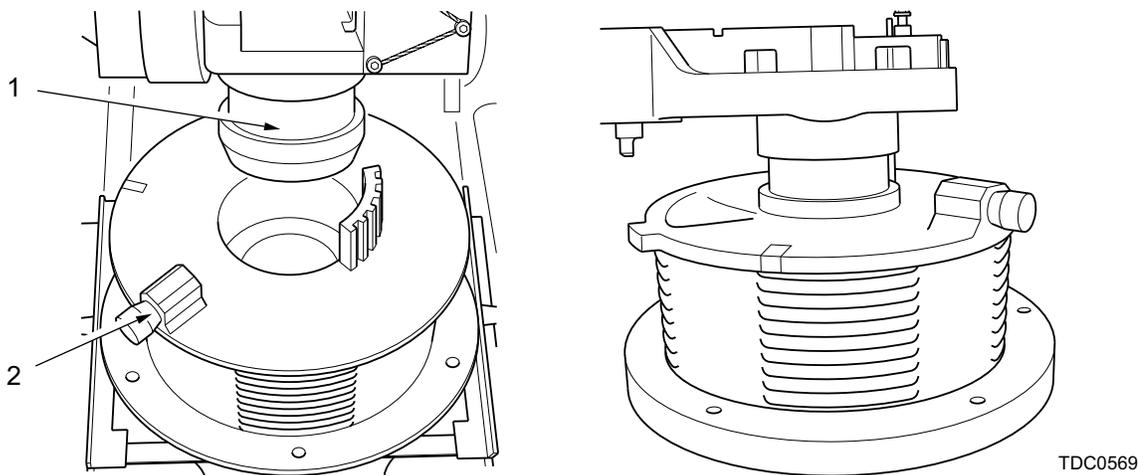
INSTALLATION

- 1 Lower carrier (1) into breechblock (2), by moving breech lever to the CLOSE position. Insert pump handle into trunnion adaptor, pump back and forth on handle and carefully lower carrier into the breechblock. Ensure breechblock maintains same angle as the carrier when being lowered.
- 2 Lower carrier (1) into breechblock (2) until the breechblock gear and carrier rack gear are engaged.

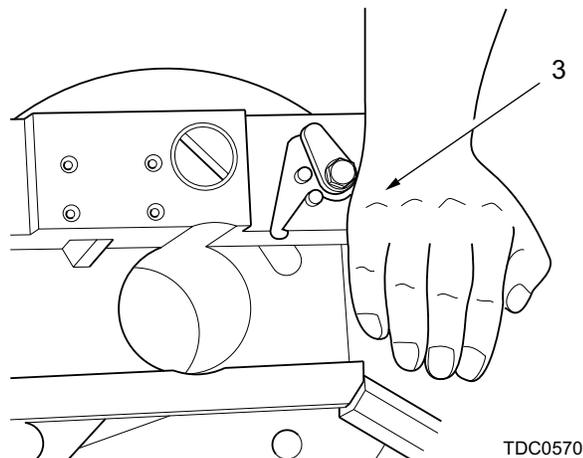
NOTE

When carrier assembly is at stops the gearing is aligned, the witness marks will not be aligned. Carrier witness marks will be offset to the left.

- 3 Continue to lower carrier (1) until the carrier stops (witness mark will be misaligned CW).



- 4 Move breech lever to the OPEN position, while applying downward pressure on the carrier (3), slowly open breech until an audible click is heard or witness mark is visibly offset aligned.
- 5 Move breech lever to the CLOSE position, while applying downward pressure on the carrier (1), close breech until carrier is fully seated onto the breechblock and witness marks are aligned.



- 6 Install spindle assembly (Para 3-7g).

3-7 BREECH MECHANISM ASSEMBLY MAINTENANCE (cont)

i. Body Assembly

INSTALLATION

NOTE

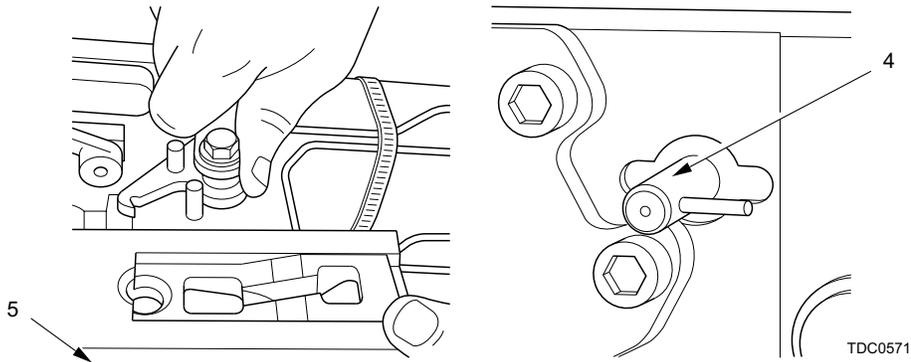
To install body assembly, it may be necessary to apply upward pressure to the spindle.

- 1 Rotate latch assembly (1) CW and place body assembly (2) over top of spindle assembly and slide body assembly forward until it is fully seated against the primer feed lock (3) in carrier assembly.

NOTE

Verify slots are completely engaged into primer feed lock.

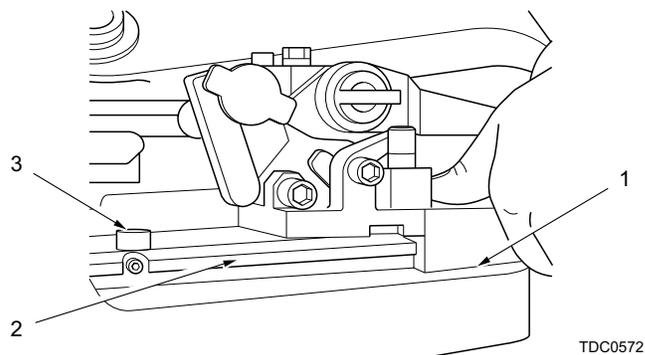
- 2 Rotate primer feed lock (4) 45° CW and lock body assembly into carrier assembly (5).



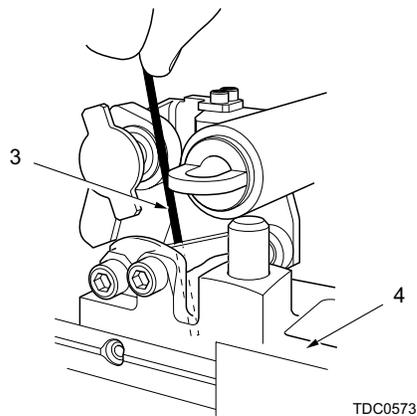
j. Tray Assembly

INSTALLATION

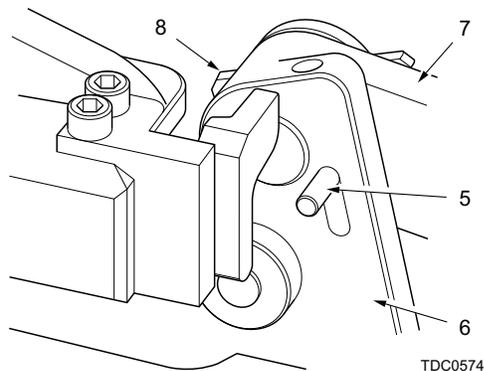
- 1 While compressing tray-locking plunger, align tray assembly guides (1) with rails of body assembly (2). Slide tray assembly forward until tray rests against body plunger (3).



- Using multi-tool (3) depress plunger and push tray assembly (4) forward. Ensure body plunger and latch are engaged and secure.



- Depress pin (5) on drive link assembly (6) and remove connector link (7). Rotate quick release assembly (8) towards drive link assembly, install connector link and release pin.



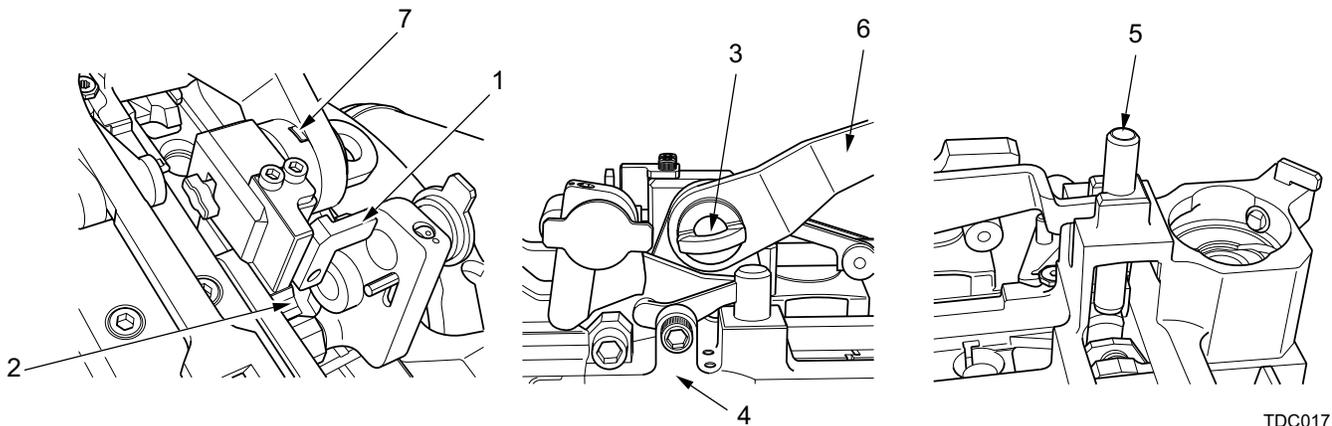
k. Injector Arm Assembly

INSTALLATION

- Push and rotate knob (1) 90° CW until on knob stop (2).
- Rotate locking shaft (3) 90° and remove from tray assembly (4).
- Insert injector arm assembly (5) into tray assembly (4) and rotate injector arm (6) to engage slots (7) on the follower.
- Insert locking shaft (3) into tray assembly (4). Rotate knob (1) CCW until engaged.

NOTE

Ensure all parts are locked and engaged.

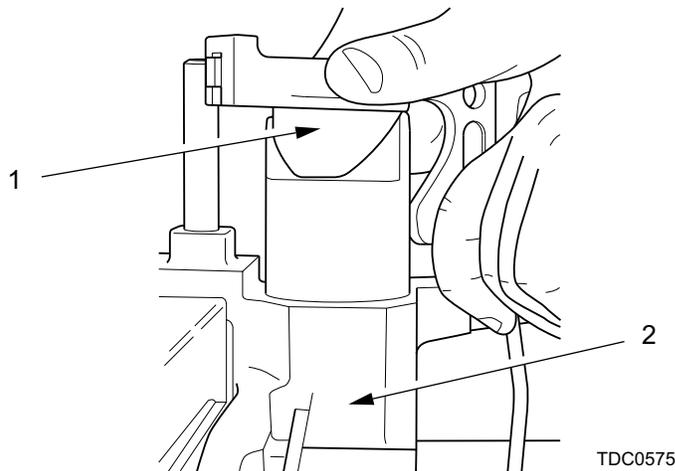


TDC0171

I. M54 Firing Mechanism

INSTALLATION

- 1 Align lugs on the M54 firing mechanism (1) with cut-outs on the tray assembly (2). While applying pressure turn the M54 firing mechanism CCW until the block plunger clicks into place.

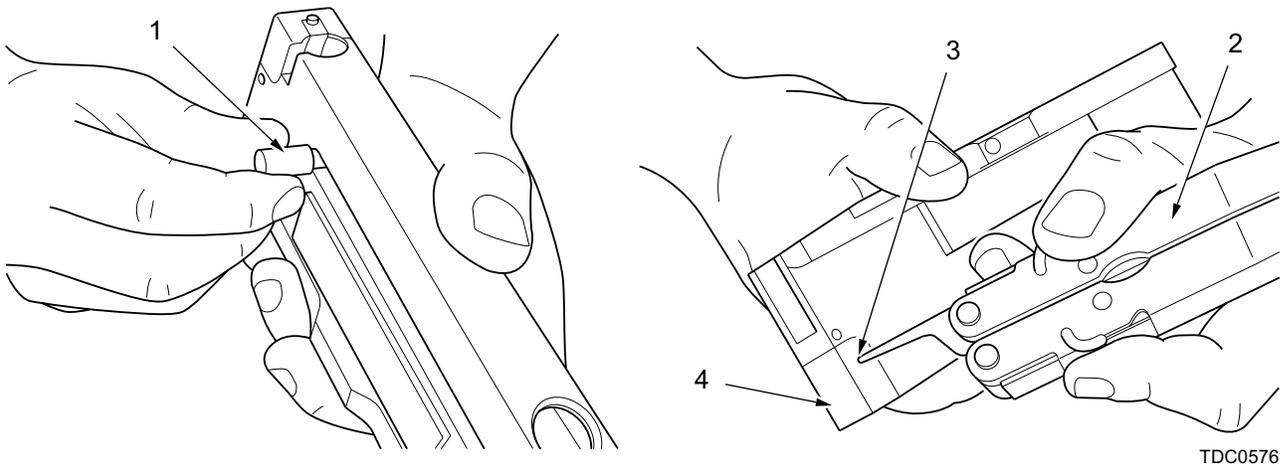


TDC0575

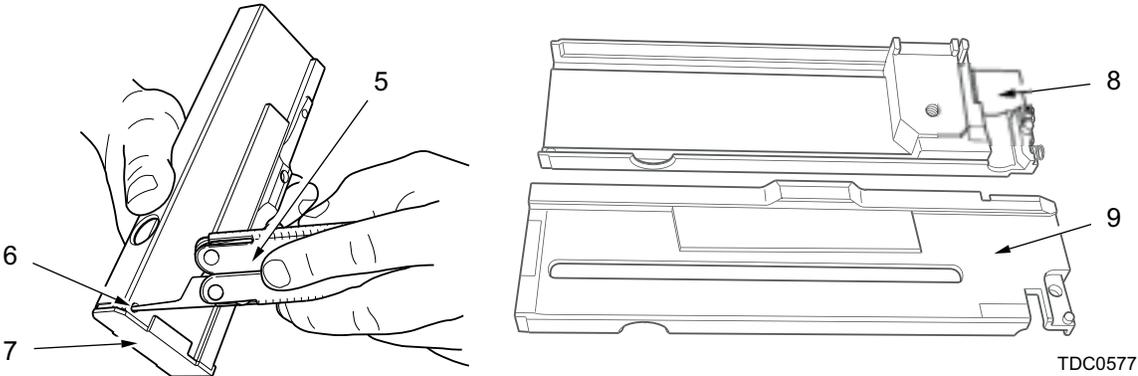
3-8 MAGAZINE ASSEMBLY MAINTENANCE

DISASSEMBLE

- 1 Remove the pull (1) by turning CCW.
- 2 Using multi-tool (2) depress plunger (3) and rotate clip (4) to disengage it from magazine assembly. Remove clip.



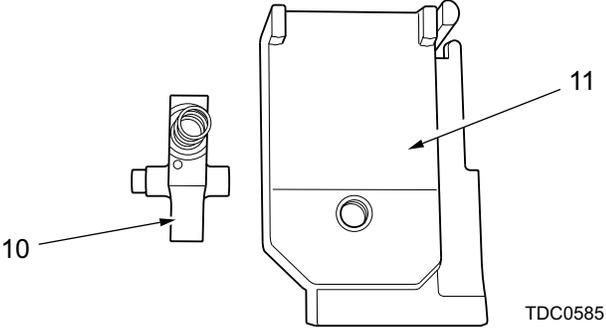
- 3 Using multi-tool (5) depress plunger (6) and remove end plate assembly (7).
- 4 Place magazine assembly (8) (bottom half down) on solid surface and remove top half magazine assembly (9).



CAUTION

Use care to avoid pulling off the spring on finger assembly during handling.

- 5 Remove finger assembly (10) and pusher assembly (11).



3-8 MAGAZINE ASSEMBLY MAINTENANCE (cont)

SERVICE AND INSPECTION

CAUTION

Do not clean nylon spools and negator spring on pusher assembly with CLP (item 7, appx D). Damage may occur to pusher assembly.

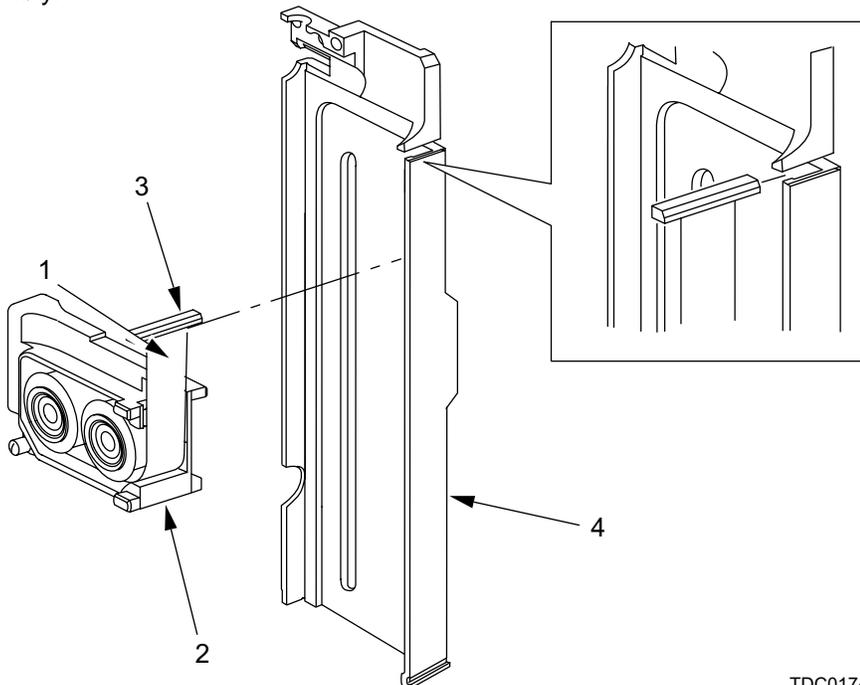
- 1 Clean, brush and remove corrosion from magazine assembly with CLP (item 7, appx D), crocus cloth (item 11, appx D) and all purpose brush. Remove excess CLP with a clean wiping rag (item 29, appx D).
- 2 Wipe nylon spools and negator spring on pusher assembly with dry rag (item 29, appx D).
- 3 If parts are corroded, pitted, cracked, worn or deformed, notify unit maintenance.
- 4 Ensure clip and end plate plungers operate correctly, by depressing plungers using forefinger and thumb. If plungers do not return, notify unit maintenance.

ASSEMBLE

NOTE

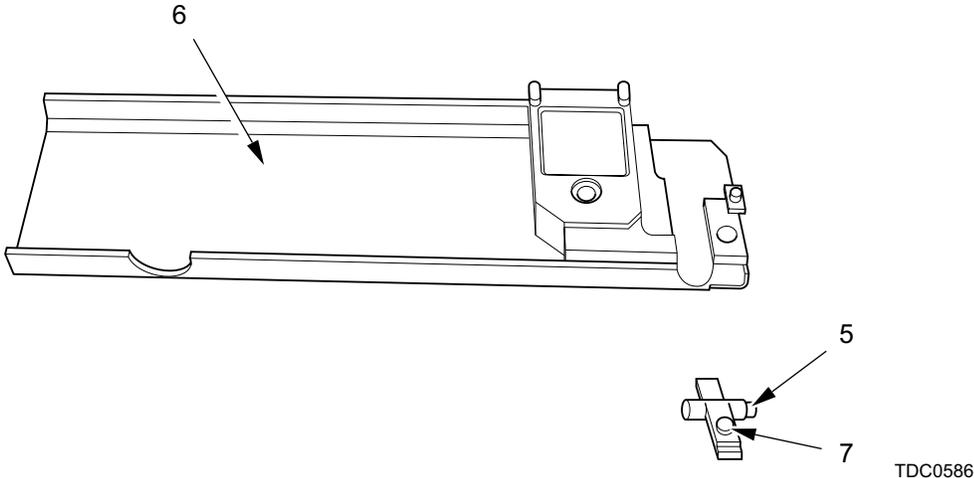
Negator spring is under tension.

- 1 Pull negator spring (1) out of pusher assembly (2) (approximately $\frac{1}{4}$ in), align hook (3) on negator spring with slot in magazine top half (4) and insert pusher assembly into magazine top half assembly.

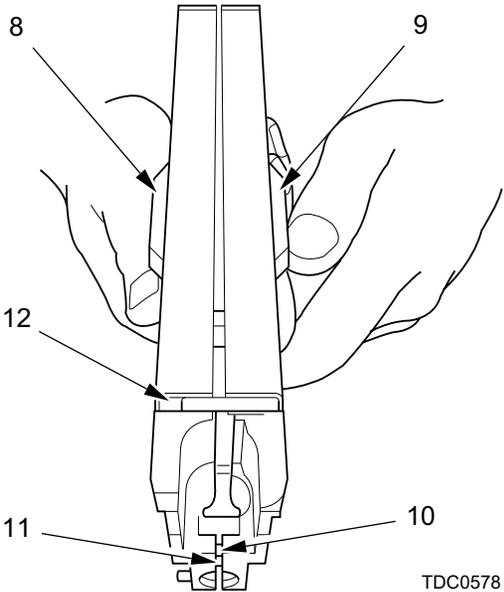


TDC0174

- 2 Install finger assembly (5) into the magazine top half assembly (6) with plunger (7) pointing away from the magazine top half assembly.



- 3 Attach magazine bottom half assembly (8) to magazine top half assembly (9). Ensure that locating pin (10) engages matching hole in magazine top half assembly and hook (11) on negator spring is in slot (12) on both magazine halves.



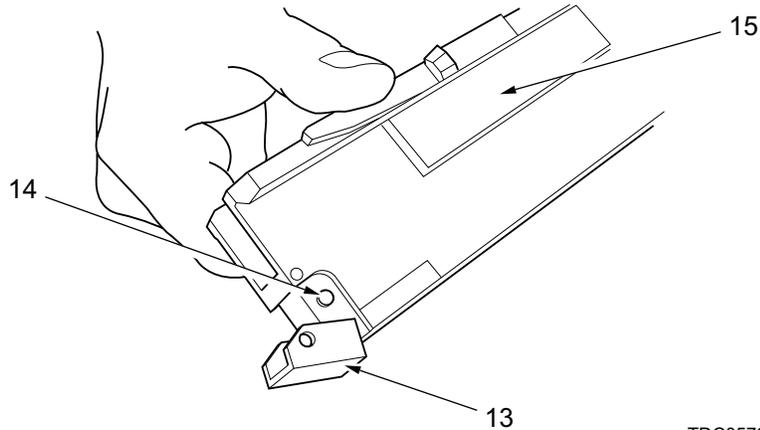
CAUTION

Use care to avoid pulling off the spring during handling.

3-8 MAGAZINE ASSEMBLY MAINTENANCE (cont)

ASSEMBLE (cont)

- 4 Position clip (13) so that it engages spring pin (14) on magazine top half assembly (15).

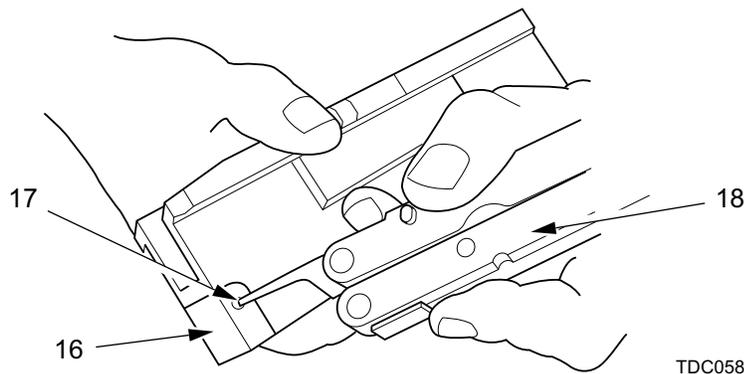


TDC0579

CAUTION

The ears on the clip should be on the outside of the two magazine halves. Do not force clip. If clip does not fit over magazine halves, they are not assembled correctly.

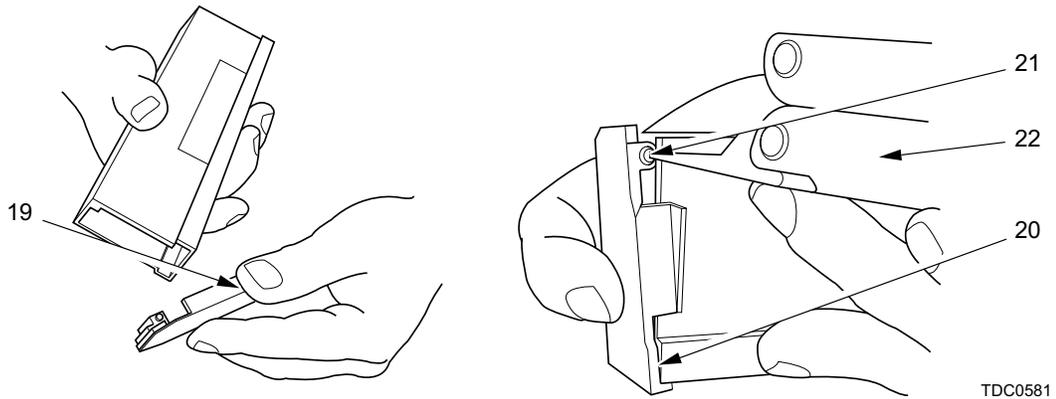
- 5 Rotate clip (16) until it contacts plunger (17) of finger assembly. Using multi-tool (18) depress plunger and rotate clip until plunger locks.



TDC0580

- 6 Position lip on end plate assembly (19), engaging slots (20) on bottom of magazine assembly and rotate end plate until it contacts plunger (21).

- 7 Using multi-tool (22) depress plunger (21) and push end plate (19) until plunger locks.



- 8 Install pull , by turning CW.

CAUTION

While under spring tension DO NOT release pull.

- 9 Retract pull and slide it forward. Pull should move back and forth smoothly.

Section V. CARRIAGE MAINTENANCE PROCEDURES

Section Index

Paragraph		Page
3-9	Top Carriage Maintenance.....	3-106
3-10	Bottom Carriage Maintenance	3-106

3-9 TOP CARRIAGE MAINTENANCE

INSPECTION

Check carriage for any unusual or excessive noise due to improper adjustments, worn or loose parts, lack of lubricant, foreign matter, or moisture. Lubricate (see Sect I).

3-10 BOTTOM CARRIAGE MAINTENANCE

a. Wheel Assembly Maintenance

REMOVAL

- 1 Apply handbrake on both wheels.
- 2 Using a 33 mm socket wrench and handle, loosen eight lug nuts (1).

WARNING

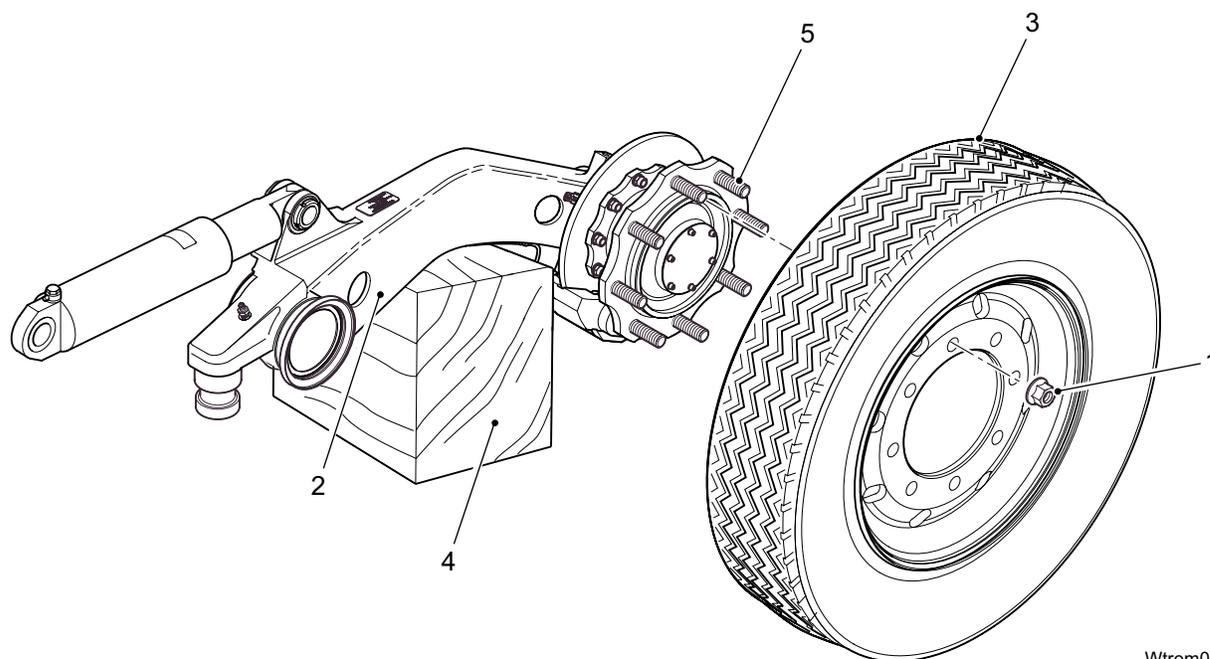
THE WHEEL, WHEEL ARM ASSEMBLY, HYDROSTRUT AND HUB WEIGH APPROXIMATELY 294 LB (133 KG) AND ARE TO BE HANDLED WITH THE AID OF AN ASSISTANT OR LIFTING EQUIPMENT. CARELESS HANDLING MAY RESULT IN INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT.

- 3 Raise the wheel arm (2) and wheel and tire assembly (3) sufficiently for the wheel and tire assembly (3) to clear the ground.
- 4 Using wooden support (4), support the wheel arm (2), ensuring that the wheel and tire assembly (3) still clears the ground.

WARNING

THE WHEEL AND TIRE ASSEMBLY WEIGHS APPROXIMATELY 135 LB (61.2 KG) AND IS TO BE HANDLED WITH THE AID OF AN ASSISTANT OR LIFTING EQUIPMENT. CARELESS HANDLING MAY RESULT IN INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT.

- 5 Using a 33 mm socket wrench and handle, remove eight wheel nuts (1) from wheel studs (5) and remove the wheel and tire assembly (3).



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SERVICE AND INSPECTION

- 1 Using clean wiping rags (item 29, appx D) and CLP (item 7, appx D), clean all components.
- 2 Inspect all components for wear and damage. Replace as necessary.

INSTALLATION

WARNING

THE WHEEL AND TIRE ASSEMBLY WEIGHS APPROXIMATELY 135 LB (61.2 KG) AND IS TO BE HANDLED WITH THE AID OF AN ASSISTANT OR LIFTING EQUIPMENT. CARELESS HANDLING MAY RESULT IN INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT.

- 1 Install the wheel and tire assembly (3) onto studs (5).
- 2 Using a 33 mm socket wrench and handle, install eight wheel nuts (1) onto the wheel studs (5).

WARNING

THE WHEEL, WHEEL ARM ASSEMBLY, HYDROSTRUT AND HUB WEIGHS APPROXIMATELY 294 LB (133 KG) AND IS TO BE HANDLED WITH THE AID OF AN ASSISTANT OR LIFTING EQUIPMENT. CARELESS HANDLING MAY RESULT IN INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT.

3-10 BOTTOM CARRIAGE MAINTENANCE (cont)

a. Wheel Assembly Maintenance (cont)

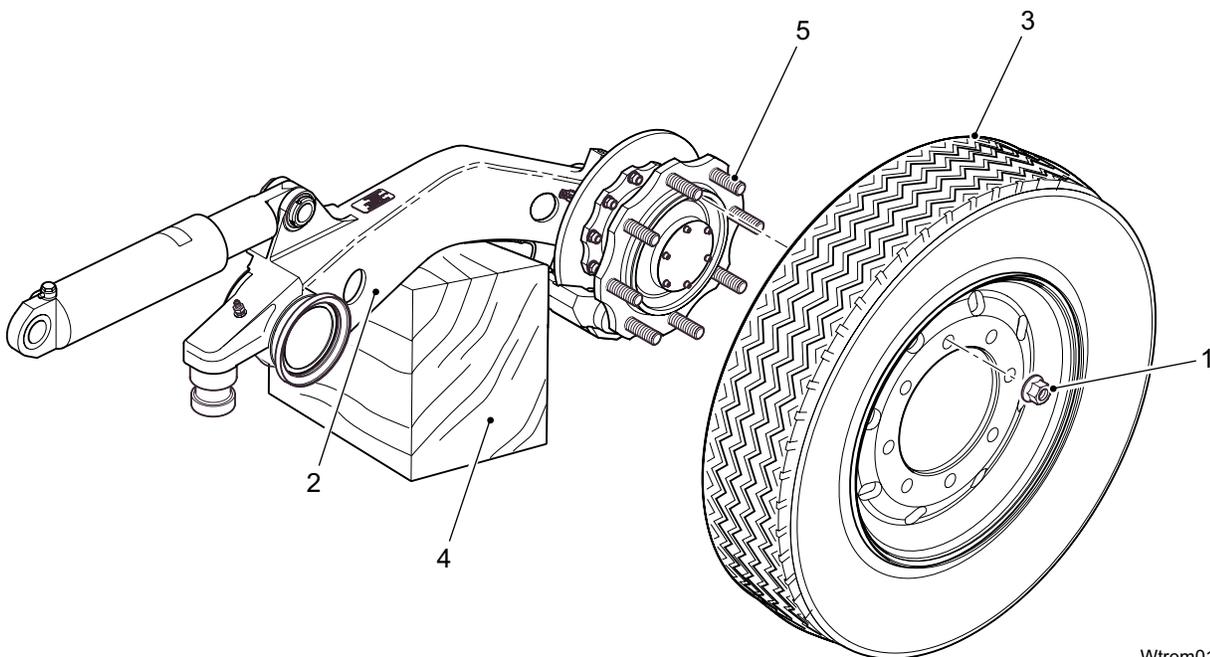
INSTALLATION (cont)

- 3 Raise the wheel arm (2) and wheel and tire assembly (3) sufficiently to remove the wooden support (4)
- 4 Remove the wooden support (4) and lower the wheel arm (2) to the ground.

NOTE

Notify unit maintenance as soon as possible to torque lugnuts.

- 5 Using a 33 mm socket and wrench, tighten eight-wheel nuts (1).



b. Tire Assembly Maintenance

REMOVAL

WARNING

THE WHEEL AND TIRE ASSEMBLY WEIGHS APPROXIMATELY 135 LB (61.2 KG) AND IS TO BE HANDLED WITH THE AID OF AN ASSISTANT OR LIFTING EQUIPMENT. CARELESS HANDLING MAY RESULT IN INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT.

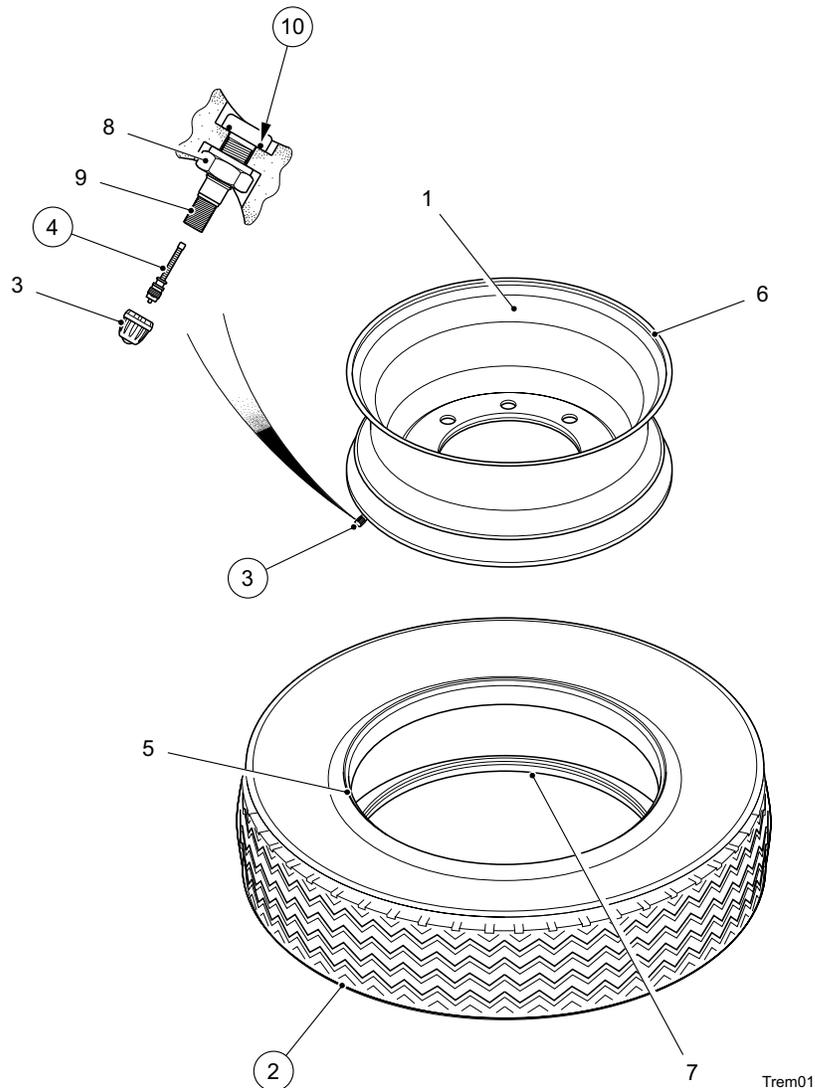
- 1 Place the wheel (1) and tire (2) on a flat surface and remove valve dust cap (3). Using a valve core tool, fully deflate the tire by opening the valve core (4).
- 2 Turn the wheel (1) over to allow work on the back of the wheel (1).

- 3 Using the bead breaker, unseat the back tire bead (5) from rim (6).

NOTE

Apply soapy water to the rim/bead of the tire to aid removal.

- 4 Turn the wheel (1) and tire (2) over to allow work on the front side of the wheel (1).
- 5 Using the bead breaker, unseat the front tire bead (7) from the wheel rim (6).
- 6 Using tire irons, lever the front tire bead (7) over the back rim (6).
- 7 Using tire irons, lever the back tire bead (5) over the back rim (6). Discard tire (2).
- 8 Using a 16 mm socket wrench and handle, remove the valve body locknut (8).
- 9 Using a softheaded hammer, remove the valve body (9) together with seal (10) and valve core (4) from the wheel (1). Discard seal (10) and valve core (4).



3-10 BOTTOM CARRIAGE MAINTENANCE (cont)

b. Tire Maintenance (cont)

SERVICE AND INSPECTION

- 1 Remove all traces of old tire from wheel.
- 2 Using clean wiping rags (item 29, appx D) and CLP (item 7, appx D), clean all components.
- 3 Inspect all wheel components for wear and damage. Replace as necessary.

INSTALLATION

WARNING

THE WHEEL AND TIRE ASSEMBLY WEIGHS APPROX 135 LB (61.2 KG) AND IS TO BE HANDLED WITH THE AID OF AN ASSISTANT OR LIFTING EQUIPMENT. CARELESS HANDLING MAY RESULT IN INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT.

- 1 Install the valve body (9) and new seal (10) ensuring it is correctly seated within the wheel rim (6). Do not insert the valve core (4) at this stage.
- 2 Using a 16 mm socket wrench, install the valve body locknut (8).

NOTE

Apply water to the rim/bead of the tire to aid installation.

- 3 Using tire irons, install new tire (2) onto rim (6), starting with the part of the tire bead in the central well of the wheel to allow the opposite part of the bead to be stretched over the rim (6).
- 4 Lubricate the tire beads (7) with water.

WARNING

DO NOT EXCEED THE RECOMMENDED TIRE PRESSURE. FAILURE TO DO SO MAY CAUSE SERIOUS INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT.

- 5 Using an air compressor and hose inflate the tire (2) to 60 ± 3 psi (4 ± 0.2 bar)
- 6 Using a brush and soapy water, check for leaks from the tire and the seal between the tire beads (5) and (7) and the rim (6).
- 7 Deflate the tire (2).

NOTE

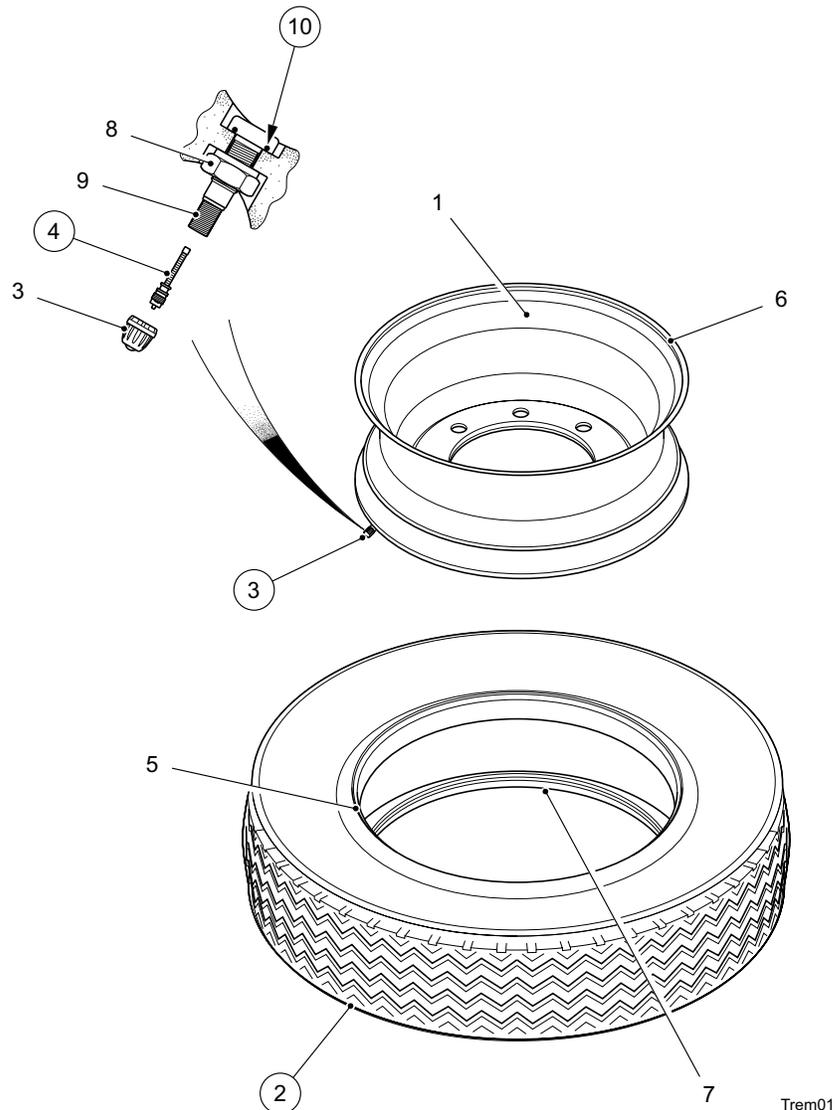
If there is a leak from the tire then replace the tire (2). If there is a leak from the seal between the tire beads (5) and (7) and the rim (6) then remove the tire (2) and check that the rim is in a serviceable condition.

- 8 Using the core removal tool, install a new valve core (4) into the valve body (9).

WARNING

DO NOT EXCEED THE RECOMMENDED TIRE PRESSURE. FAILURE TO DO SO MAY CAUSE SERIOUS INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT.

- 9 Using air compressor and hose, inflate the tire to 60 ± 3 psi (4 ± 0.2 bar).
- 10 Using a brush and soapy water, check for leaks from the valve core (4).
- 11 If there is a leak from the valve core (4), deflate the tire (2) and replace the valve core (4). Using air compressor and hose, inflate the tire to 60 ± 3 psi (4 ± 0.2 bar).
- 12 Install dust cap (3).



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Section VI. OPTICAL FIRE CONTROL EQUIPMENT BATTERY MAINTENANCE PROCEDURES

Section Index

Paragraph	Page
3-11	Optical Fire Control (OFC) Equipment Battery Maintenance Procedures 3-112

3-11 OPTICAL FIRE CONTROL (OFC) EQUIPMENT BATTERY MAINTENANCE PROCEDURES



WARNING
Read and follow all warnings in WARNING SUMMARY.
Pay careful attention to those about batteries.



REMOVAL

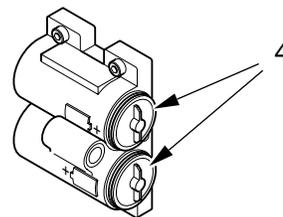
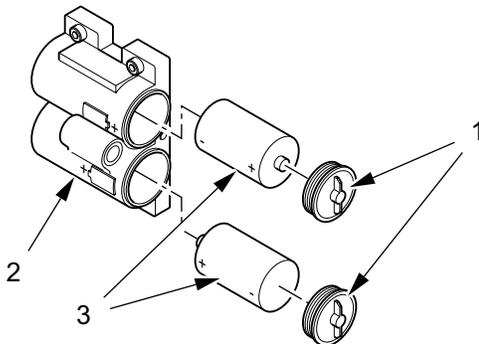
- 1 Check for broken, damaged, or missing parts.
- 2 Check for illumination.
- 3 Repair is by replacement of authorized parts.
- 4 Replace battery if required:
 - (a) Unscrew cap (1) assembly from body (2).
 - (b) Remove batteries (3). If component is level and battery won't slide out, reverse battery cap assembly and use embedded magnet (4).

INSTALLATION

CAUTION

Pay careful attention to polarity diagram on battery enclosure. Do not install batteries backwards or severe equipment damage may result.

- 1 Install new batteries making sure battery is inserted properly in accordance with diagram on battery enclosure.
- 2 Install cap assembly (1) and tighten with fingers only.



Section VII. CHIEF OF SECTION DISPLAY (CSD) MAINTENANCE PROCEDURES

Section Index

Paragraph		Page
3-12	Chief of Section Display (CSD) Maintenance Procedures.....	3-113

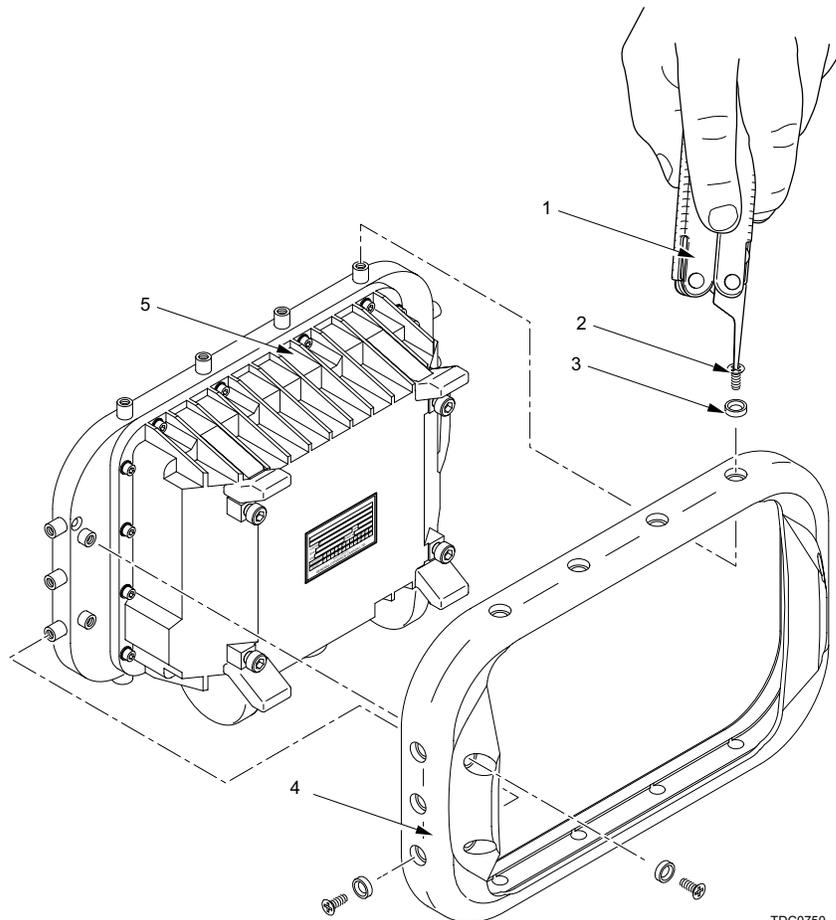
3-12 CHIEF OF SECTION DISPLAY (CSD) MAINTENANCE PROCEDURES

REMOVAL OF CSD RUBBER BUMPER

WARNING

RUBBER BUMPER MAY BE UNDER TENSION FROM BEING STRETCHED OVER THE CHIEF OF SECTION DISPLAY. TAKE CARE WHEN REMOVING RUBBER BUMPER. FAILURE TO DO SO MAY CAUSE INJURY TO PERSONNEL.

- 1 Using multi-tool (1) loosen and remove eighteen screws (2) and special washers (3) securing the rubber bumper (4) to the CSD (5).
- 2 Remove rubber bumper (4) from CSD (5).



TDC0750

3-12 CHIEF OF SECTION DISPLAY (CSD) MAINTENANCE PROCEDURES (cont)

SERVICE AND INSPECTION OF CSD

CAUTION

Do not clean CSD and/or rubber bumper with CLP (item 7, appx D), or expose CSD to high water pressure. Damage may occur to CSD and/or rubber bumper.

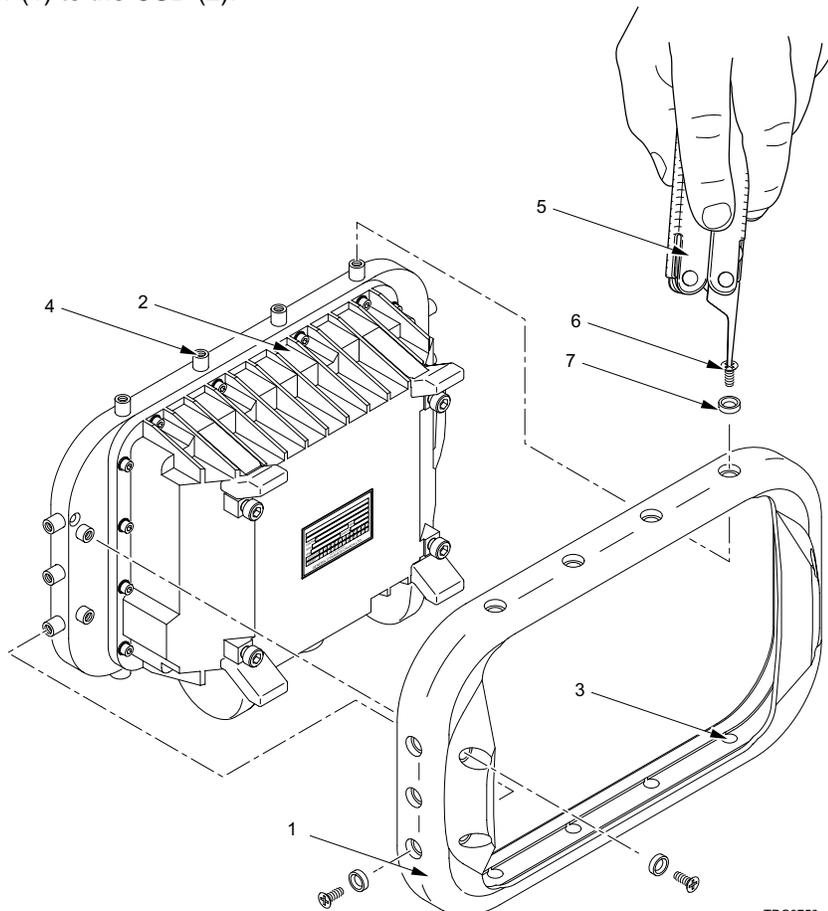
- 1 Using a clean wiping rag (item 29, appx D), clean CSD.

INSTALLATION OF CSD RUBBER BUMPER

WARNING

RUBBER BUMPER MAY BE UNDER TENSION FROM BEING STRETCHED OVER THE CHIEF OF SECTION DISPLAY. TAKE CARE WHEN REMOVING RUBBER BUMPER. FAILURE TO DO SO MAY CAUSE INJURY TO PERSONNEL.

- 1 Install new rubber bumper (1) around CSD (2) and align holes (3) on bumper with CSD sockets (4).
- 2 Using multi-tool (5), install and tighten eighteen screws (6) and special washers (7) securing rubber bumper (1) to the CSD (2).



TDC0750

Section VIII. AUXILLARY MAINTENANCE PROCEDURES

Section Index

Paragraph		Page
3-13	Vehicular Taillight Maintenance	3-115

3-13 VEHICULAR TAILLIGHT MAINTENANCE

INSPECTION

- 1 Connect cable assembly to prime mover.
- 2 Make sure all lamps operate.

Section IX. FIRE CONTROL ALIGNMENT TESTS AND MEASUREMENTS

Section Index

Paragraph		Page
3-14	Purpose	3-116
3-15	Frequency	3-116
3-16	Test of M1A1 Gunners Quadrant	3-116
3-17	Leveling Trunnions	3-130
3-18	Testing M17A1 and M18A1 Fire Control Quadrants	3-131
3-19	Reliability Test of Pantel	3-136
3-20	Alignment Test of M171A1 Telescope and Quadrant Mount and Pantel	3-137
3-21	M154 Alignment Device Comparison Test	3-139

3-14 PURPOSE

The fire control alignment tests and measurements determine if the on-carriage fire control, gunners quadrant, and the alignment device, are in correct adjustment. Send equipment that fails these tests to unit maintenance.

3-15 FREQUENCY

Recommended intervals for the following tests are:

- a. Once each year if howitzer is used for nonfiring training.
- b. Once every 3 months if howitzer is fired.
- c. As soon as possible after extensive use.
- d. Following accidents.
- e. After traveling over extremely rough terrain.
- f. When fire control mounts have been replaced.
- g. Whenever the weapon fires inaccurately for no apparent reason.
- h. After replacement of cannon tube.
- i. After 3rd echelon (DS) maintenance.

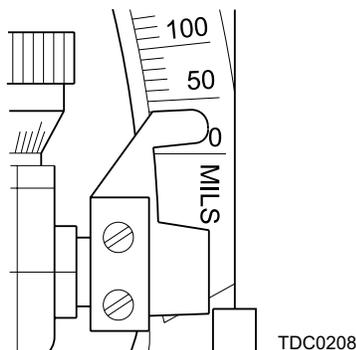
3-16 TEST OF M1A1 GUNNERS QUADRANT

NOTE

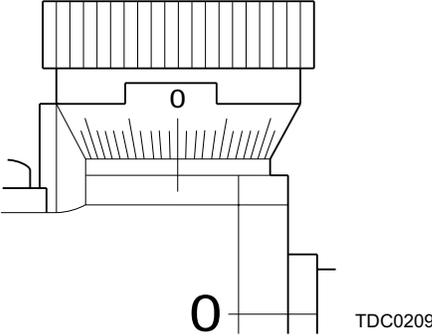
Before testing gunners quadrant inspect quadrant shoes and seats for dirt or defects.

MICROMETER TEST

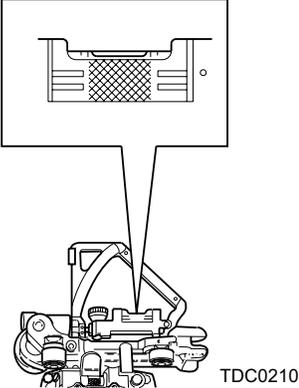
- 1 Set index at +10.



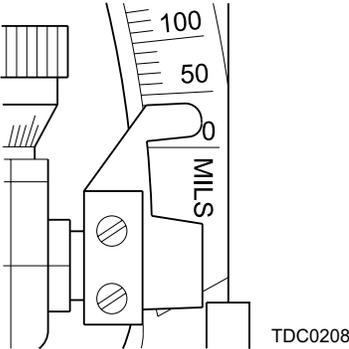
2 Zero the micrometer.



3 Point gunners quadrant to muzzle end of cannon tube and elevate cannon to center bubble.



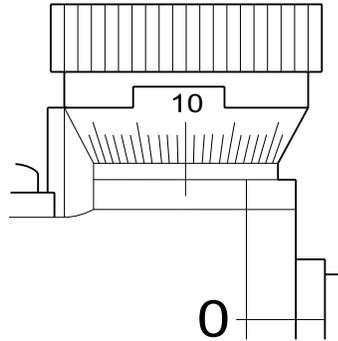
4 Set index at 0.



3-16 TEST OF M1A1 GUNNERS QUADRANT (cont)

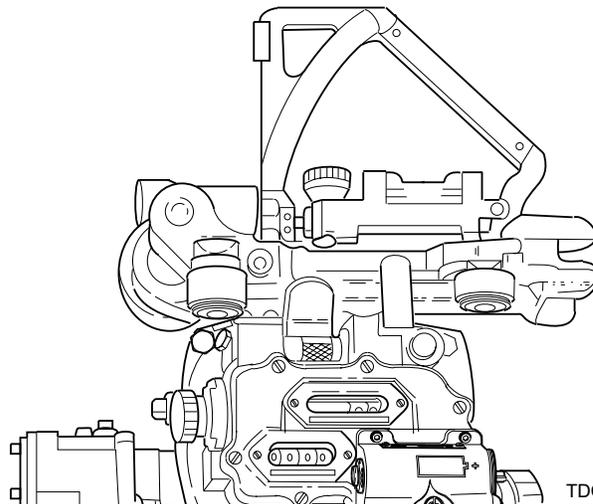
MICROMETER TEST (cont)

- 5 Set micrometer at 10.



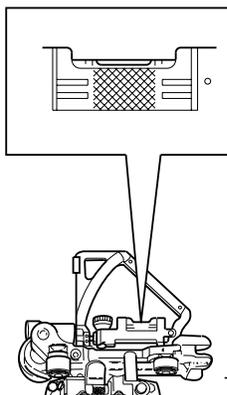
TDC0454

- 6 Point gunners quadrant to muzzle end of cannon tube.



TDC0211

- 7 Bubble should re-center.

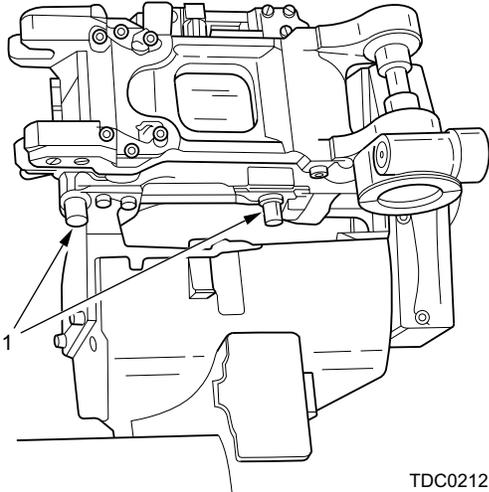


TDC0210

- 8 If bubble does not re-center, the micrometer is in error. Send the gunners quadrant to unit maintenance.

END-FOR-END TEST

- 1 Inspect elevation quadrant seats (1).

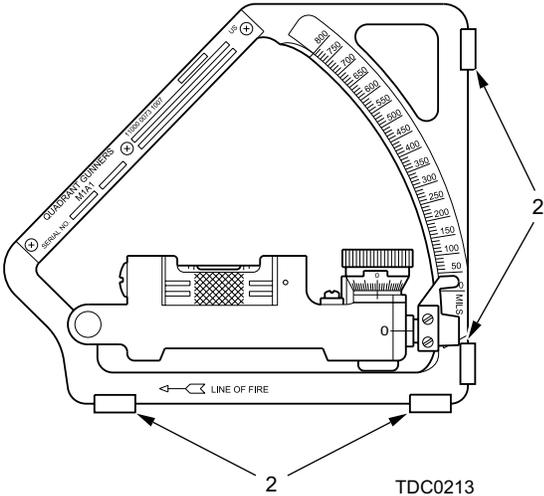


TDC0212

NOTE

Maximum allowance tolerances are ± 0.4 mil.

- 2 Inspect gunners quadrant shoes (2).

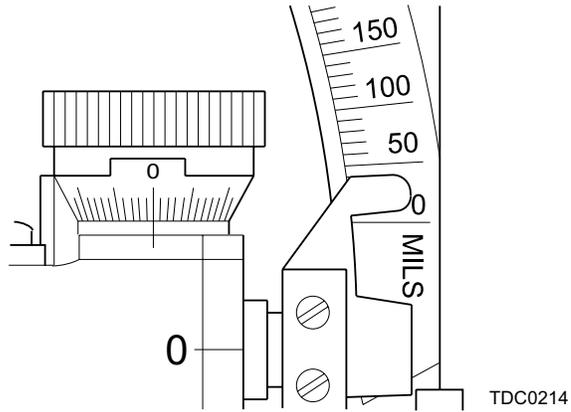


TDC0213

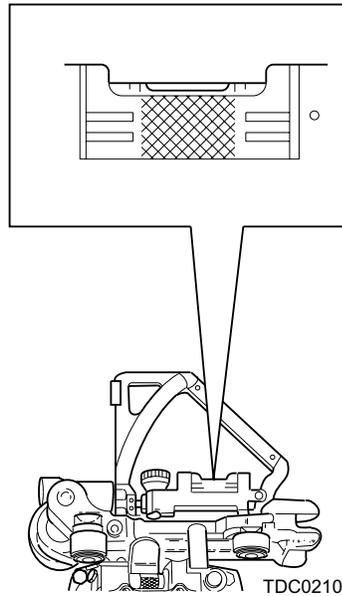
3-16 TEST OF M1A1 GUNNERS QUADRANT (cont)

END-FOR-END TEST (cont)

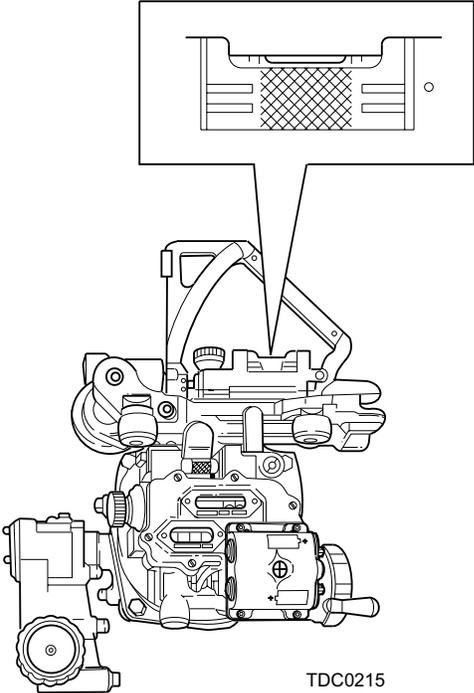
- 3 Zero the scales.



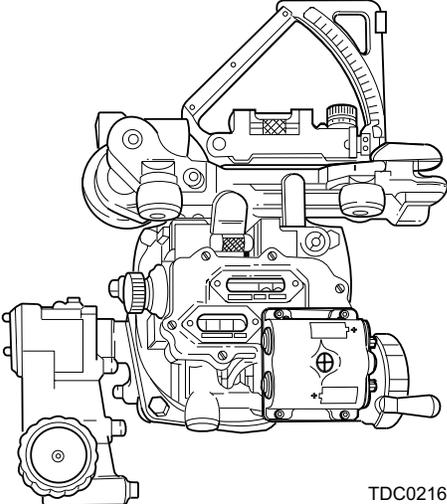
- 4 Point gunners quadrant toward muzzle end of cannon tube.



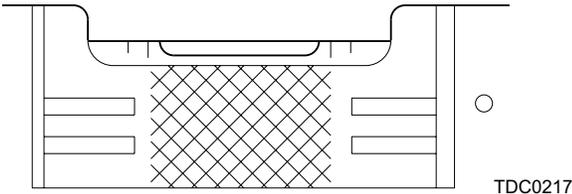
5 Elevate cannon tube to center bubble.



6 Reverse direction of gunners quadrant.



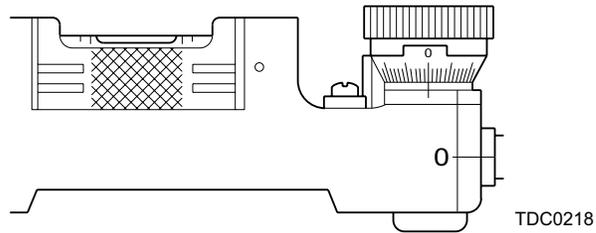
7 If bubble centers, test is complete. If bubble does not center, go to step 8.



3-16 TEST OF M1A1 GUNNERS QUADRANT (cont)

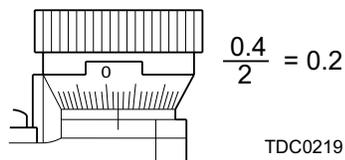
END-FOR-END TEST (cont)

- 8 Center bubble with micrometer knob. If bubble centers, go to step 9. If it does not, go to step 15.



POSITIVE CORRECTION

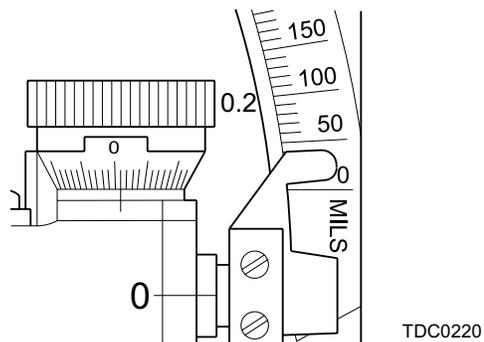
- 9 Divide micrometer reading by 2.



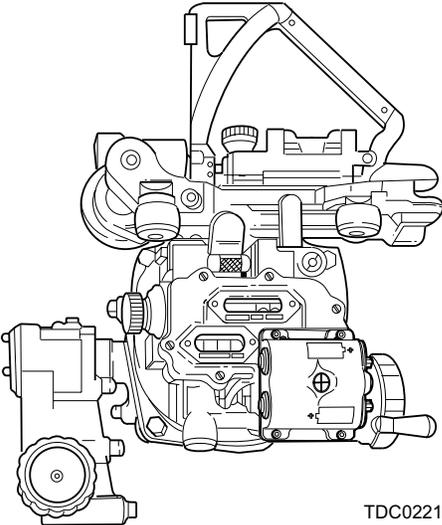
NOTE

Each short line on micrometer scale equals 0.2 mil.

- 10 Put result on micrometer scale.

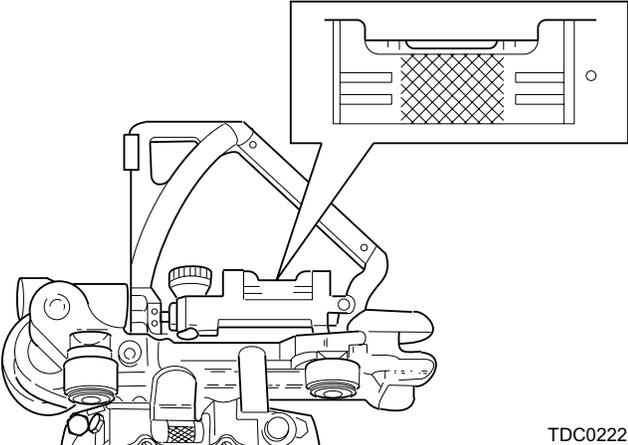


11 Point gunners quadrant toward muzzle end of cannon tube.



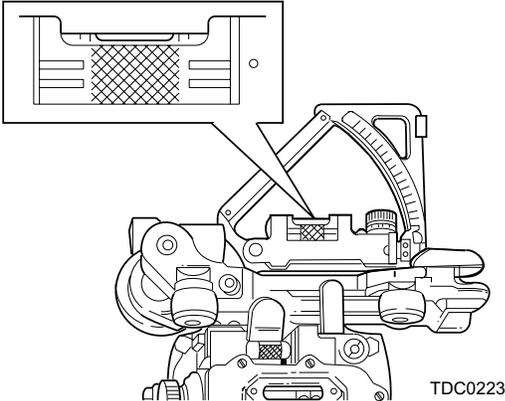
TDC0221

12 Elevate cannon tube to center bubble.



TDC0222

13 Reverse direction of gunners quadrant. Bubble should center.

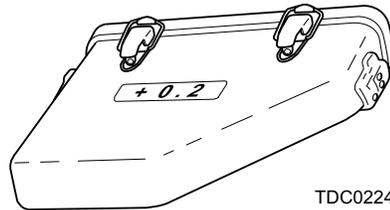


TDC0223

3-16 TEST OF M1A1 GUNNERS QUADRANT (cont)

END-FOR-END TEST (cont)

- 14 Record end-for-end correction on carrying case.

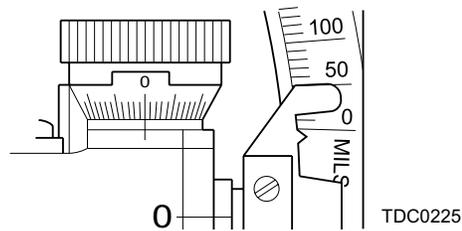


TDC0224

NEGATIVE CORRECTION

- 15 Set index at -10.

NEGATIVE CORRECTION
(Bubble did not center at step 8.)

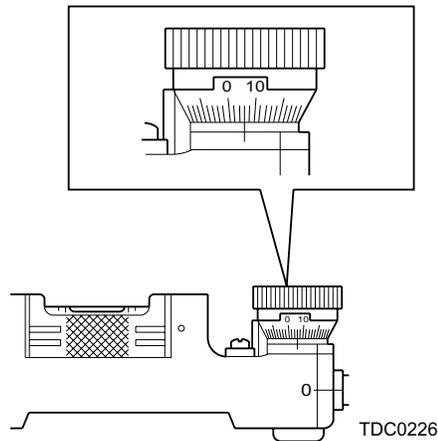


TDC0225

NOTE

If bubble did not center at step 8, the following tests should be made:

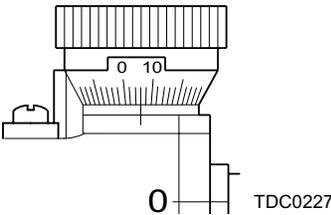
- 16 Center bubble with micrometer knob.



TDC0226

17 Add 10 to micrometer reading.

$$\begin{array}{r} 10.0 \\ + 9.6 \\ \hline 19.6 \end{array}$$

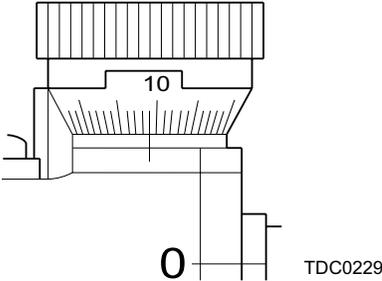


18 Divide sum by 2.

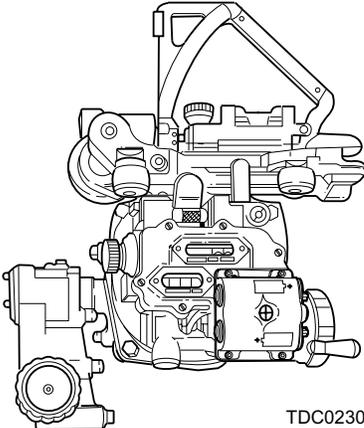
$$\frac{19.6}{2} = 9.8$$

TDC0228

19 Place answer on micrometer scale.



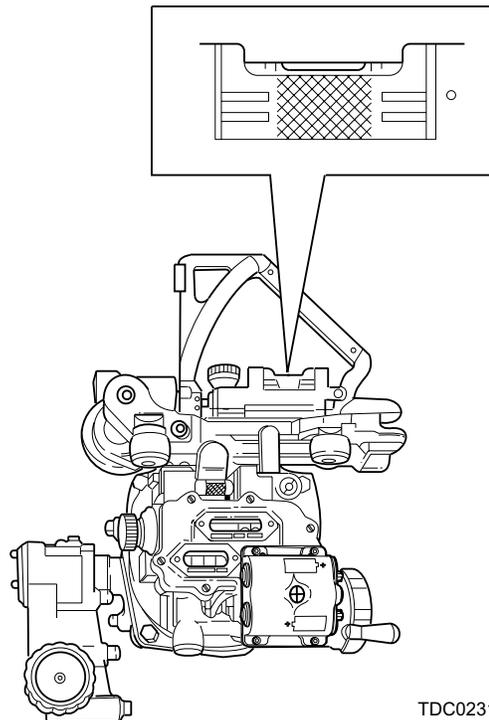
20 Point gunners quadrant toward muzzle end of cannon tube.



3-16 TEST OF M1A1 GUNNERS QUADRANT (cont)

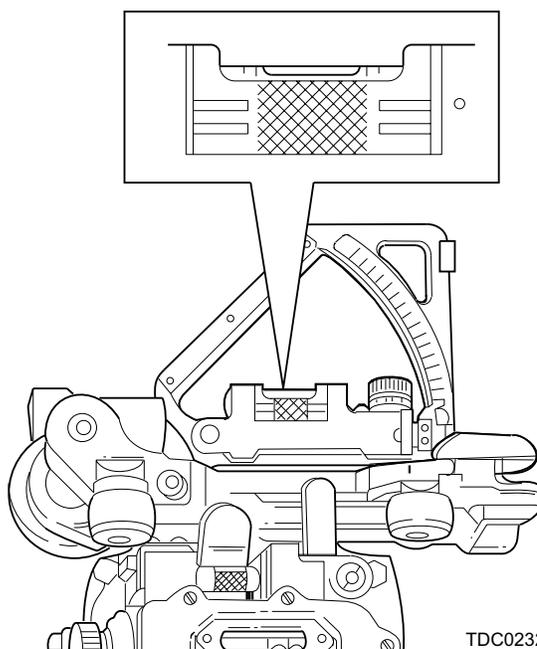
END-FOR-END TEST (cont)

21 Elevate cannon tube to center bubble.



TDC0231

22 Reverse direction of gunners quadrant. Bubble should center.



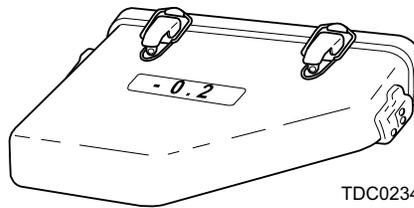
TDC0232

- 23 Subtract micrometer reading from 10.

$$\begin{array}{r} 10.0 \\ - 9.8 \\ \hline - 0.2 \end{array}$$

TDC0233

- 24 Record end-for-end correction.



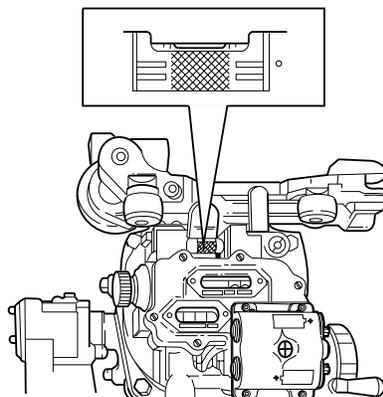
TDC0234

VERTICAL SHOE TEST

WARNING

MAKE SURE ALL PERSONNEL ARE CLEAR OF CANNON RECOIL PATH.
LOSS OF NITROGEN PRESSURE CAN ALLOW CANNON TO FALL OUT OF
BATTERY.

- 1 On high angle 800-1600 mil scale, set M18A1 quadrant to 800 mils, elevate cannon until elevation level bubble is centered, and cross level M18A1 quadrant as required.

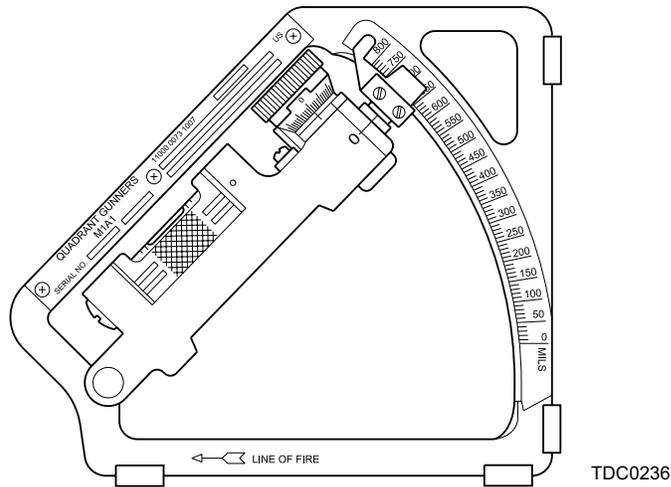


TDC0235

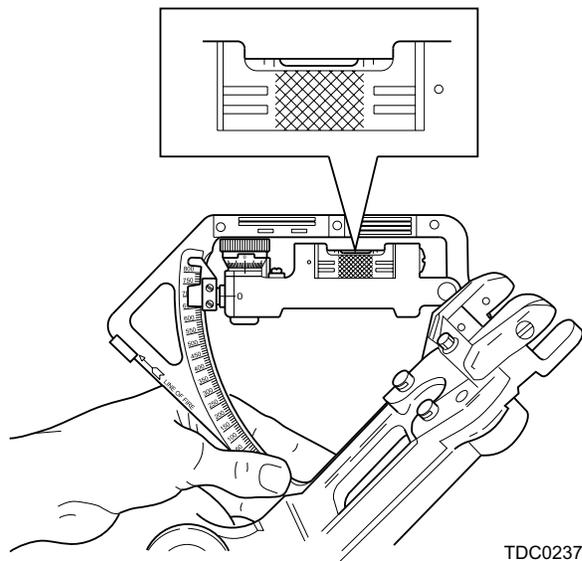
3-16 TEST OF M1A1 GUNNERS QUADRANT (cont)

VERTICAL SHOE TEST (cont)

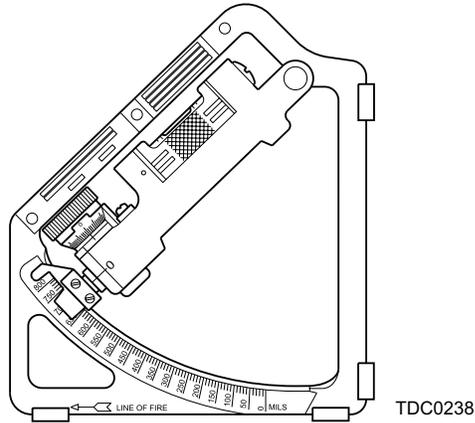
- 2 Set 800 mils on gunners quadrant 0-800 mil coarse scale. If there is a correction factor for the horizontal shoes, set corresponding micrometer scale to correction factor; otherwise, set micrometer scale to 0.



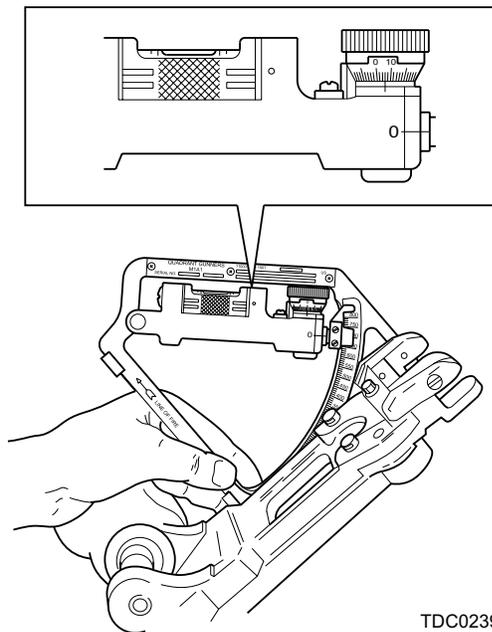
- 3 Set gunners quadrant on M172A1 telescope and quadrant mount quadrant seats, with gunners quadrant LINE OF FIRE arrow toward muzzle end of cannon tube. If gunners quadrant level bubble is not centered, elevate or depress cannon until the bubble is centered.



- 4 Remove gunners quadrant from M172A1 telescope and quadrant mount.
- 5 Set 800 mils on gunners quadrant 800-1600 mil coarse scale.



- 6 Place gunners quadrant vertical shoes on M172A1 telescope and quadrant mount quadrant seats, with gunners quadrant LINE OF FIRE arrow toward muzzle end of cannon tube.
- 7 Center level bubble on gunners quadrant with micrometer knob. Gunners quadrant should read 800 mils ± 0.4 mil.
- 8 If gunners quadrant reading deviates more than ± 0.4 mil, the gunners quadrant is defective, notify unit maintenance.



3-17 LEVELING TRUNNIONS

NOTE

When leveling trunnions in the motor pool, it is not necessary to deploy spades.

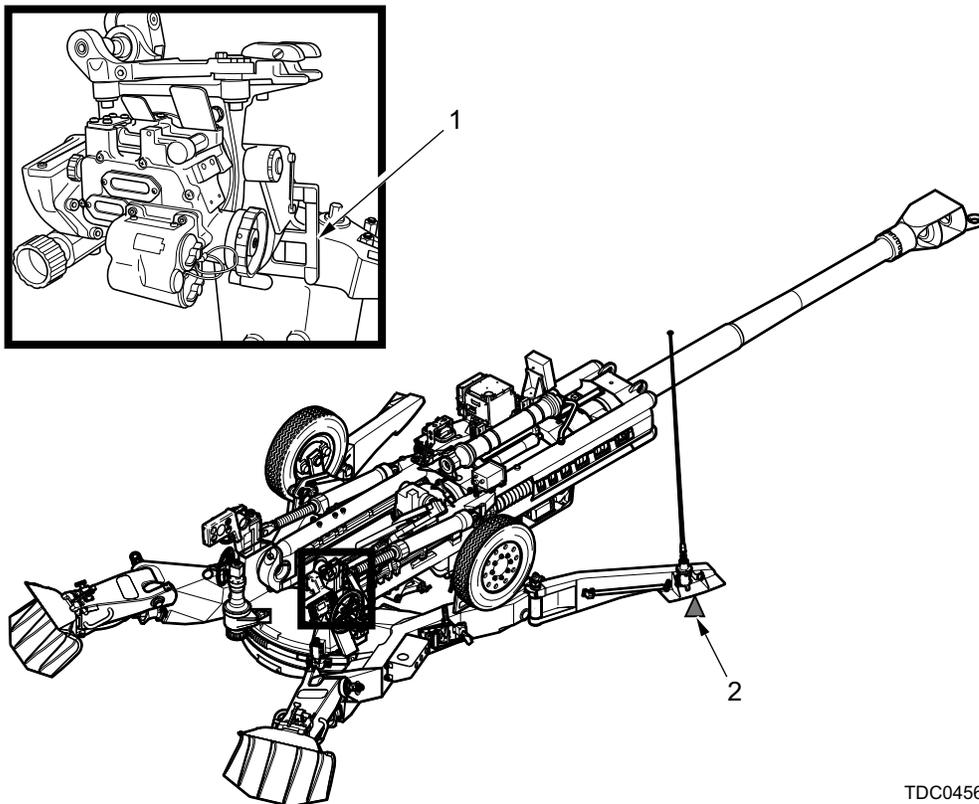
- 1 Place the howitzer in firing position on a hard surface, such as concrete or asphalt, if possible; if not, place on solid ground. If spades are deployed, they do not need to be dug in.
- 2 Set cannon tube to zero mils.
- 3 Set a pretested gunners quadrant on the direct side adapter plate (1) with any correction applied. Observe and record the position of the quadrant bubble.

NOTES

Depending which side the gunners quadrant bubble is displaced (left or right), will determine which side of the howitzer to raise. If bubble is displaced right, then raise left side of howitzer and vice versa.

If suspension system fails, use jack mechanical leveling to raise howitzer and insert shims under the stabilizer.

- 4 Using pump handle raise the howitzer on whichever side is necessary to center the gunners quadrant bubble. Insert the maximum possible shims under the stabilizer foot (2), using suspension lever, lower howitzer.
- 5 Repeat step 4 until the gunners quadrant bubble remains centered. Trunnions are now level.



TDC0456

3-18 TESTING M17A1 AND M18A1 FIRE CONTROL QUADRANTS



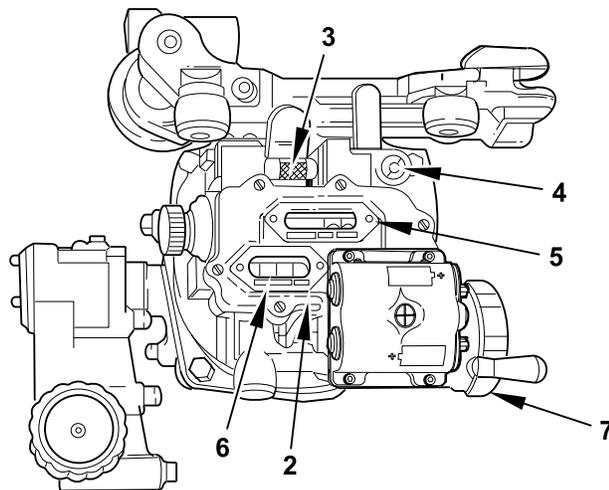
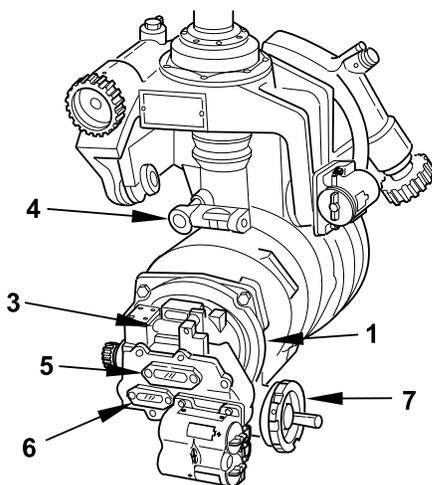
WARNING

Read and follow all warnings in WARNING SUMMARY.
Pay careful attention to those about batteries.



TDC0450

- 1 Before starting, make sure there are no obvious defects on the M17A1 fire control quadrant (1) or the M18A1 fire control quadrant (2). Check the M17A1 and M18A1 fire control quadrants for looseness or wobble in their mounting on the trunnions. Also check that the markings on the elevation level vials (3) and cross level vials (4) are legible and are illuminated when the battery enclosure switch is turned to ON.
- 2 Place the howitzer in firing position on a hard surface, such as concrete or asphalt, if possible. Spades must be in the firing position, but do not need to be dug in. Trunnions must be level.
- 3 Set M17A1 and M18A1 elevation correction counters (5) to 00, and set elevation counters (6) to 0000. To eliminate backlash, rotate elevation control knob (7) with the last motion in a CW direction.



TDC0241

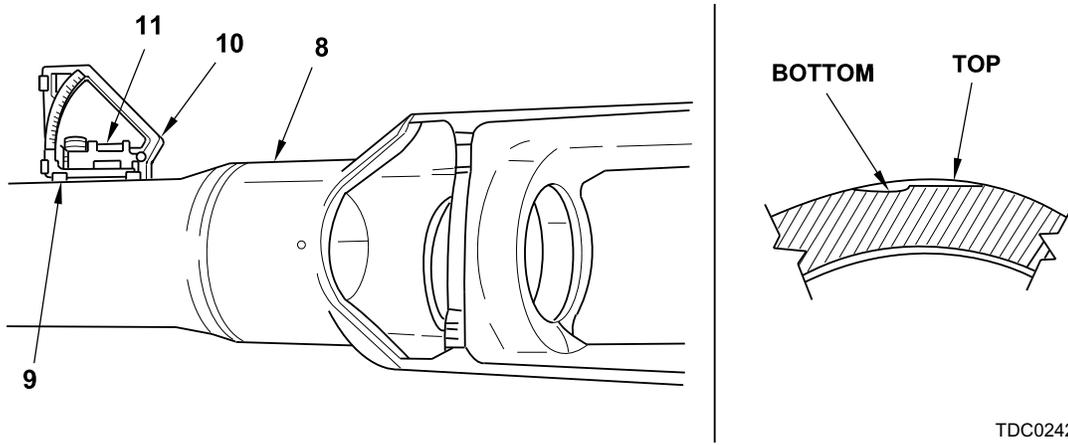
- 4 Depress the cannon tube (8) to 0 mils, using the M17A1 fire control quadrant.
- 5 Ensure cannon tube leveling pads (9) are clean.

NOTE

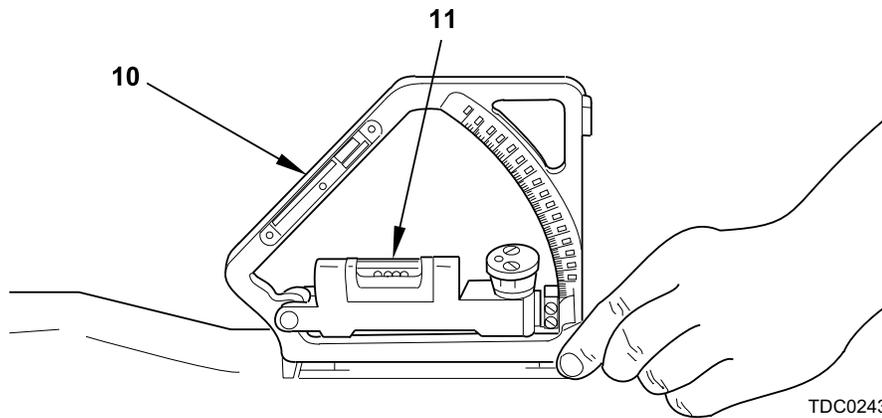
Be sure to place gunners quadrant on the top surface of the cannon tube leveling pad; use of the bottom surface may lead to erroneous readings.

- 6 Place the pre-tested gunners quadrant (10), with corrections applied, on cannon leveling pads (9), aligning with edge of top surface as shown, with the LINE OF FIRE arrow pointed toward the muzzle end of cannon tube.
- 7 Elevate the cannon tube (8) with the elevating handwheel until the gunners quadrant bubble (11) centers.

3-18 TESTING M17A1 AND M18A1 FIRE CONTROL QUADRANTS (cont)



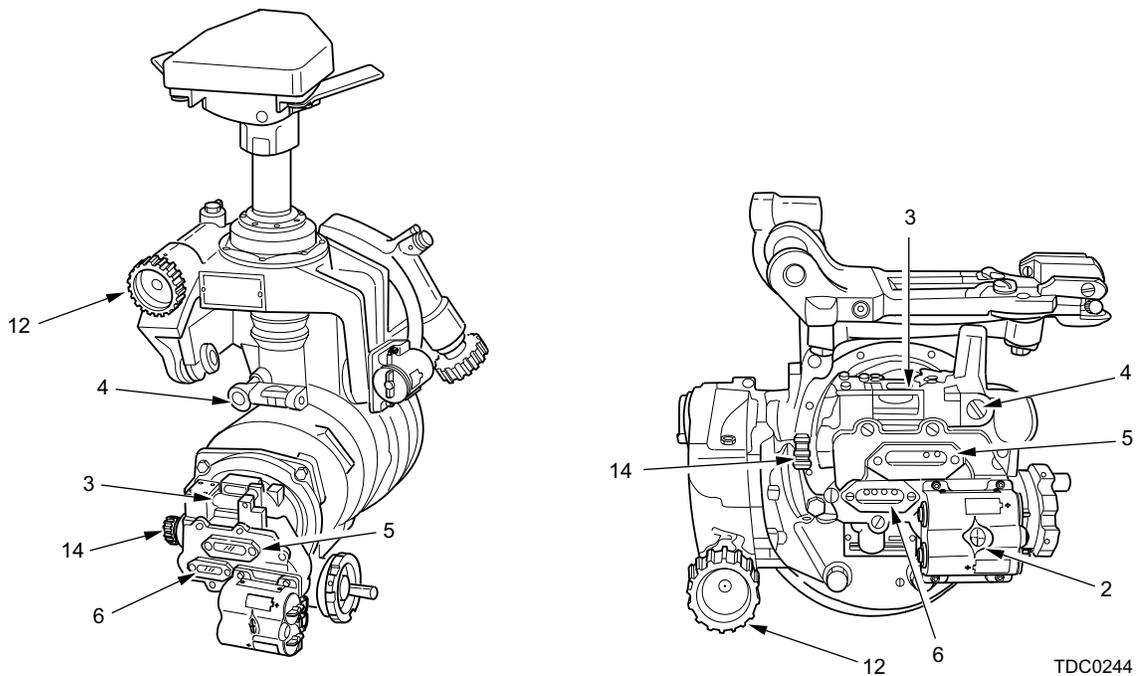
- 8 Rotate the gunners quadrant (10) end-for-end. The gunners quadrant bubble (11) should re-center. If the gunners quadrant bubble does not re-center, verify the gunners quadrant correction factor and repeat steps 5 through 7.



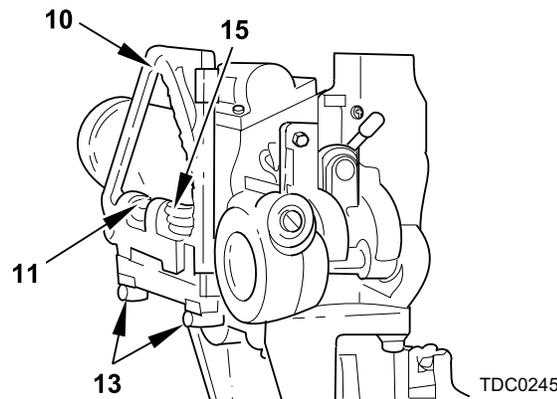
NOTE

To eliminate backlash during leveling, last motion of pitch/elevation and cross level control knobs will be in a CW direction.

- 9 Level the M17A1 and M18A1 fire control quadrants by turning the cross level control knobs (12) until the cross level vials (4) center. With elevation counters (6) set at 0000, the bubbles in the elevation level vials (3) should be centered. If the bubbles in the elevation vials are not centered, either the counters, or the level vials, are out of adjustment. Notify unit maintenance.



- 10 With the bubbles in each elevation level vial and cross level vial still centered, place the gunners quadrant (10) on the quadrant seats (13) with the LINE OF FIRE arrow towards the muzzle.
- 11 Center the gunners quadrant bubble (11) and record the reading. The quadrant seats (13) are out of adjustment if the reading changes over 1 mil. Notify unit maintenance.

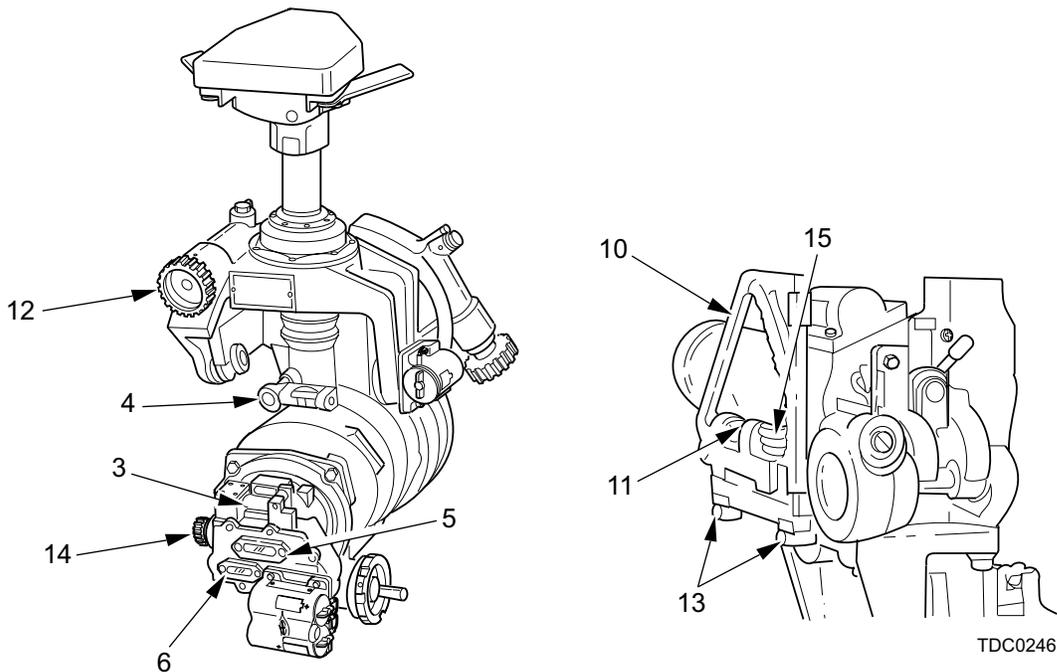


NOTE

Do not forget the gunners quadrant correction factor when taking these readings.

- 12 Using the elevation correction knobs (14), insert a + 5 mil correction in both elevation correction counters (5). The reading in each elevation counter (6) should now read 9995. Set each elevation counter back to zero. Elevate the cannon tube until the bubble in the elevation level vial (3) of the M18A1 fire control quadrant centers. Center the gunners quadrant bubble (11). The micrometer (15) should show an increase of 5 mils. When the bubble in the M18A1 fire control quadrant elevation level vial is centered, the bubble in the M17A1 fire control quadrant elevation level vial (3) should center ± 1 graduation.

3-18 TESTING M17A1 AND M18A1 FIRE CONTROL QUADRANTS (cont)

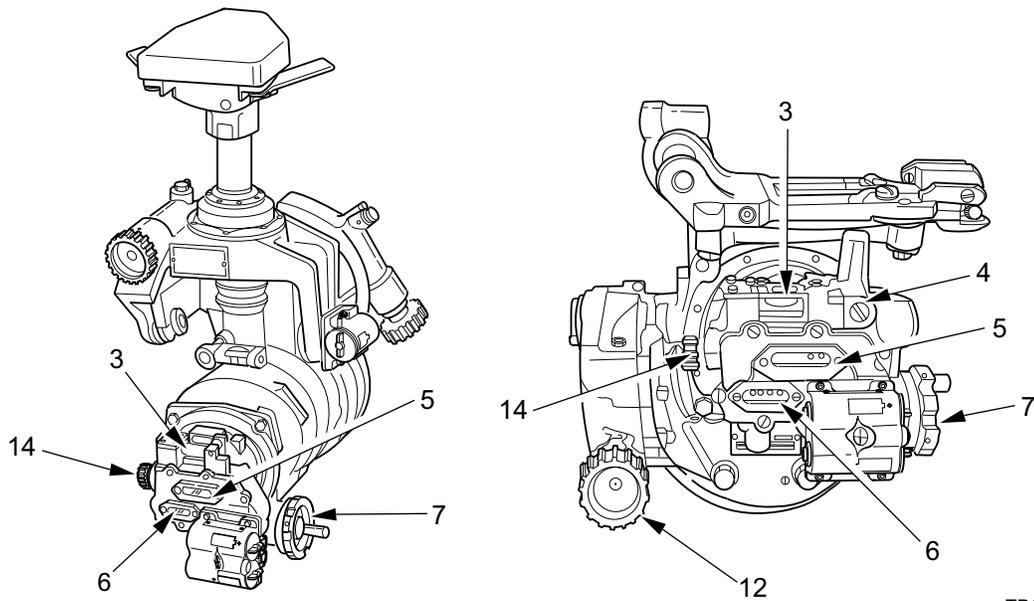


- 13 Set elevation counter (6) and elevation correction counter (5) on each fire control quadrant back to zero.
- 14 Insert corrections 10 mils at a time, up to 50 mils, on each elevation correction counter (5) and observe the following:
 - a. The reading in each elevation counter (6) should have decreased by the amount of correction applied within ± 0.5 mil.
 - b. The bubble in each elevation level vial (3) should still be centered. If either the M17A1 or M18A1 fire control quadrant does not perform properly, it is defective. Notify unit maintenance.
- 15 Return each elevation correction counter (5) to zero, using elevation correction knobs (14).
- 16 Set 400 mils on each elevation counter (6), using the elevation control knobs (7).

WARNING

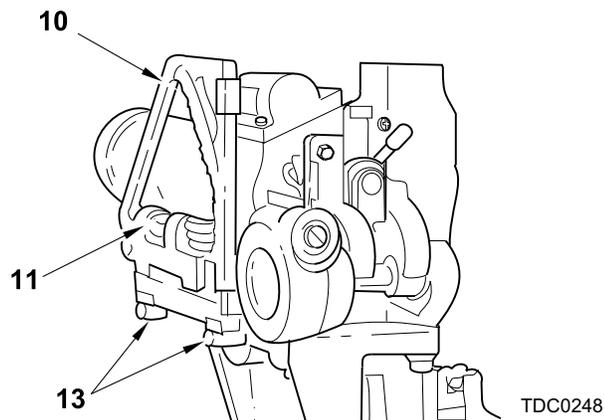
MAKE SURE ALL PERSONNEL ARE CLEAR OF CANNON RECOIL PATH.
LOSS OF NITROGEN PRESSURE CAN ALLOW CANNON TO FALL OUT OF
BATTERY.

- 17 Using the elevating handwheel, elevate the cannon tube to center the bubble in the elevation level vial (3) on the M18A1 fire control quadrant. Center the bubble in the cross level vial (4) using the cross level control knob (12). When the bubble in the M18A1 fire control quadrant elevation level vial is centered, the bubble in the M17A1 fire control quadrant elevation level vial (3) should center within ± 1 graduation.



TDC0247

- 18 Place 400 mils plus or minus any correction factor on the gunners quadrant (10). Set gunners quadrant with LINE OF FIRE arrow towards the muzzle on the quadrant seats (13). The gunners quadrant bubble (11) should center within ± 1 mil. If not, the M18A1 fire control quadrant is defective. Notify unit maintenance.
- 19 Repeat steps (15) thru (17) at 900 mils. The M17A1 and M18A1 fire control quadrant tests are now completed.



TDC0248

3-19 RELIABILITY TEST OF PANTEL



WARNING

Read and follow all warnings in WARNING SUMMARY.
Pay careful attention to those about batteries.

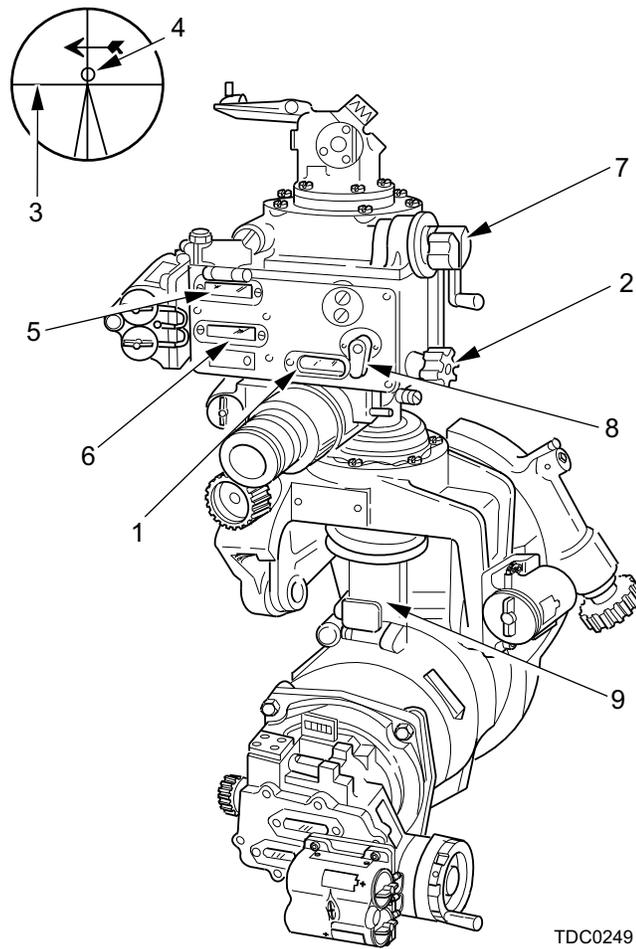


- 1 Turn M17A1 fire control quadrant and Pantel battery enclosure switches to ON.
- 2 Level the cannon tube using the M17A1 fire control quadrant. Set the Pantel correction counter (1) to zero using the gunners aid knob (2).
- 3 Level the M171A1 telescope and quadrant mount (9).
- 4 Sighting through the Pantel, align the crosshairs (3) on a sharply defined aiming point (4) at least 50 to 100 meters away (if less than 50 meters distance, use parallax shield.). Be careful not to move the crosshairs. Record the reading from the azimuth counter (5) and deflection counter (6).

NOTE

To eliminate backlash by making the last movement of the Pantel head from left to right

- 5 Using the azimuth knob (7), rotate the Pantel head through two complete CW revolutions, and re-align the crosshairs on the aiming point. Record the readings from the azimuth counter (5) and deflection counter (6). Be sure the last motion is from left to right.
- 6 Compare the azimuth and deflection counter readings obtained in steps (3) and (4). If the difference between the counter readings is greater than 1 mil, the Pantel is defective. Notify unit maintenance.
- 7 Repeat steps (4) and (5) by rotating the Pantel head CCW. Be sure the last motion is from right to left.
- 8 Using gunners aid knob (2), insert corrections 1 mil at a time, up to 50 mils, on the correction counter (1) and observe the following:
 - a. The crosshairs (3) should not move from the aiming point (4).
 - b. Reading on azimuth counter (5) should not change.
 - c. The reading from the deflection counter (6) should change by the amount of correction applied.
- 9 Repeat step (8), applying corrections in the opposite direction. If the Pantel does not perform as stated in step (8), it is defective. Notify unit maintenance.
- 10 Disengage the deflection clutch (8). Turn azimuth knob (7). The deflection counter (6) should not move.
- 11 Engage the deflection clutch (8).



TDC0249

3-20 ALIGNMENT TEST OF M171A1 TELESCOPE AND QUADRANT MOUNT AND PANTEL



WARNING

Read and follow all warnings in WARNING SUMMARY.
Pay careful attention to those about batteries.



TDC0450

- 1 Turn M18A1 fire control quadrant and Pantel battery enclosure switches to ON.
- 2 Elevate the cannon tube to 0 mils using M18A1 fire control quadrant.

NOTE

Do not disturb traverse or move the howitzer for any reason when conducting this test.

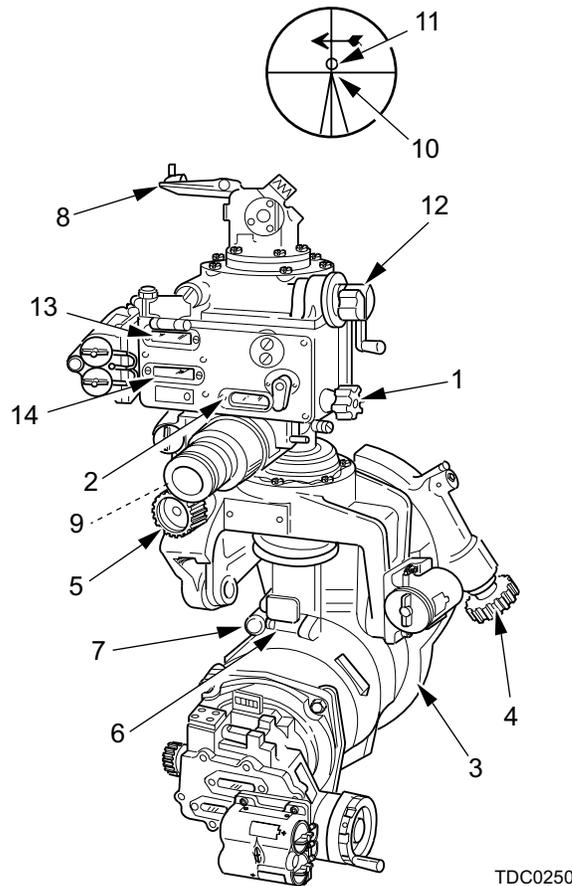
- 3 Use the correction knob (1) to set the correction counter (2) on the Pantel to zero.
- 4 Carefully level M171A1 telescope and quadrant mount (3) by turning the pitch level control knob (4) and cross level control knob (5), until the bubbles in the pitch level vial (6) and cross level vial (7) center.
- 5 Select an aiming point as far away as possible, to the left side of the howitzer, so that it will be visible during steps 6, 8, and 11.

3-20 ALIGNMENT TEST OF M171A1 TELESCOPE AND QUADRANT MOUNT AND PANTEL (cont)

NOTE

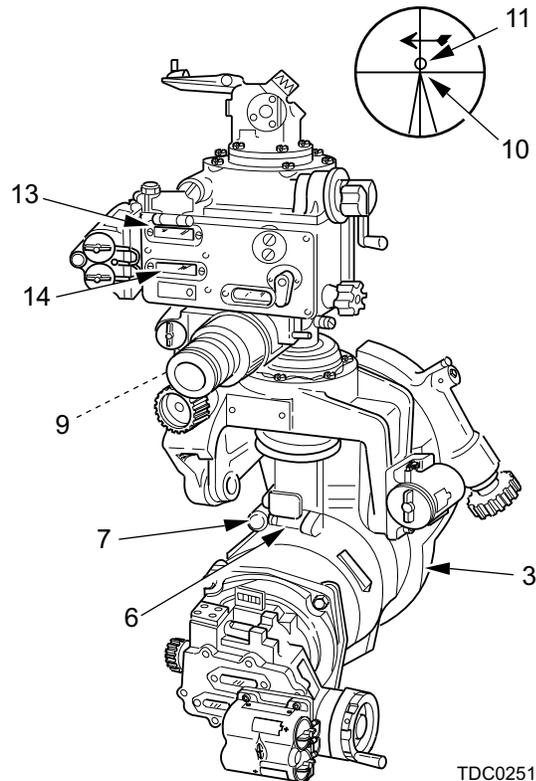
To eliminate backlash by making the last movement of the Pantel head from left to right

- 6 Close the parallax shield (8) and, with bubbles in pitch level vial (6) and cross level vial (7) still centered, sight through the eyepiece (9) and align the telescope crosshairs (10) on a sharply defined aiming point (11), by turning the azimuth knob (12). Record the readings from the azimuth counter (13) and deflection counter (14).



- 7 Slowly elevate the cannon tube to 400 mils, and re-center the bubbles in the pitch level vial (6) and cross level vial (7) on the M171A1 telescope and quadrant mount (3).
- 8 Sighting through eyepiece (9), realign the crosshairs (10) on the aiming point (11). Record the readings from the azimuth counter (13) and deflection counter (14).
- 9 Compare the readings from the azimuth counter (13) and deflection counter (14) recorded in steps 6 and 8. If the difference between the readings is greater than 1 mil, the M171A1 telescope and quadrant mount is defective. Notify unit maintenance.
- 10 Slowly elevate the cannon tube to 900 mils and re-center the bubbles in the pitch level vial (6) and cross level vial (7).

- 11 Sighting through eyepiece (9), realign the crosshairs (10) on the same aiming point (11). Record the readings of the azimuth counter (13) and deflection counter (14).
- 12 Compare the readings of the azimuth counter (13) and deflection counter (14) recorded in steps 6 and 11. If the difference between the counter readings is greater than 3 mils at 401 to 900 mils elevation, the M171A1 telescope and quadrant mount is defective. Notify unit maintenance.



3-21 M154 ALIGNMENT DEVICE COMPARISON TEST



WARNING

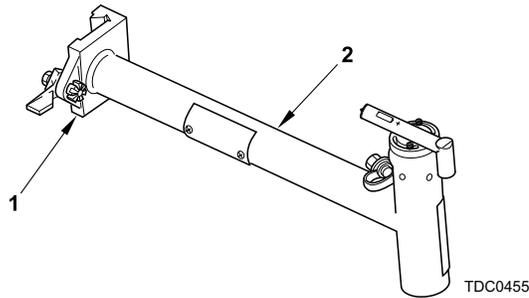
Read and follow all warnings in WARNING SUMMARY.
Pay careful attention to those about batteries.



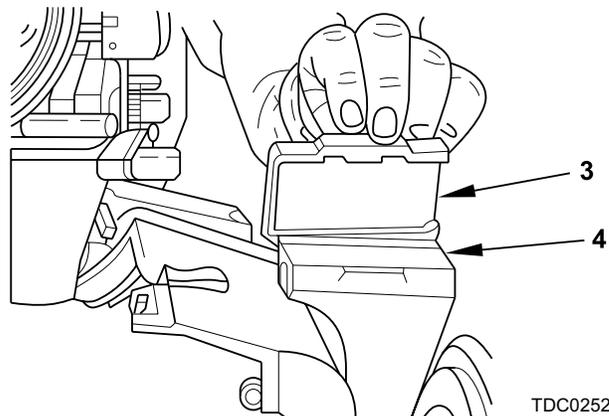
TDC0450

- 1 Get two additional M154 alignment devices from other howitzer sections. Install batteries.
- 2 Inspect mating surfaces (1) of the M154 alignment device (2) for nicks, burrs, and dirt. If dirty, clean with a clean wiping rag (item 29, appx. D). If mating surfaces (1) are burred, notify unit maintenance. If mating surfaces are not burred, continue with test.

3-21 M154 ALIGNMENT DEVICE COMPARISON TEST (cont)



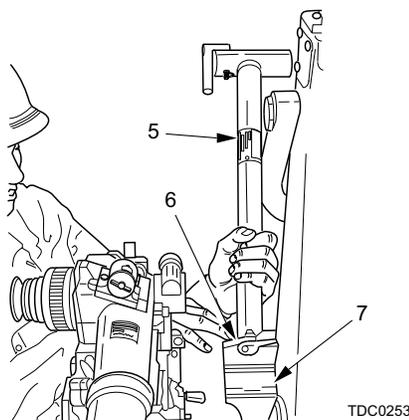
- 3 Remove protective cover (3) from dovetail (4) and check the surface as you did for the M154 alignment device in step 2. Wipe dovetail clean with a clean wiping rag (item 29, appx D). Notify unit maintenance to remove any nicks or burrs.



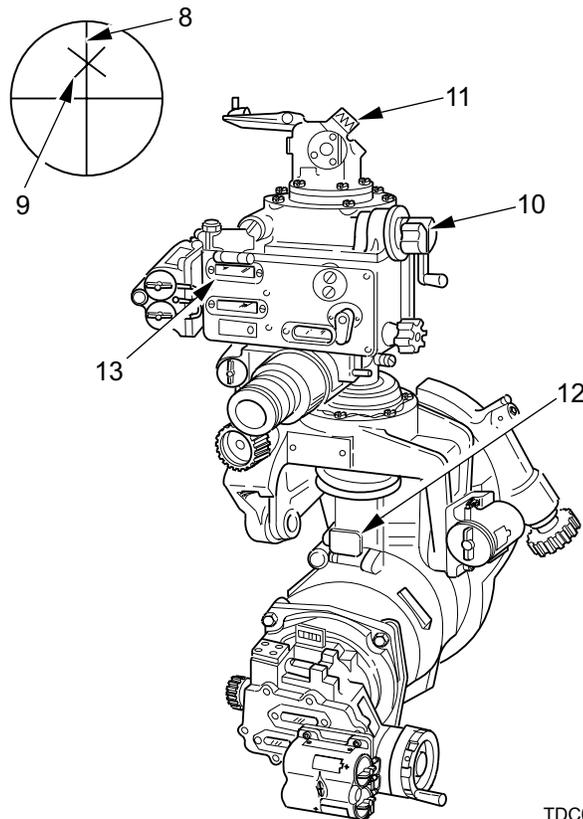
- 4 Turn M18A1 fire control quadrant battery enclosure switch to ON, and level cannon tube using the M18A1 fire control quadrant.
- 5 Install the M154 alignment device (5) and turn light switch to ON. Make sure the mating surface (6) matches with dovetail (7).
- 6 Level the M171A1 telescope and quadrant mount.

NOTE

After leveling the M171A1 telescope and quadrant mount, be careful not to disturb the pitch level setting.



- 7 Turn Pantel battery enclosure switch to ON and align the crosshairs (8) of the Pantel with the crosshairs (9) of the M154 alignment device, by turning azimuth knob (10). Center the crosshairs for elevation; turn the elevation knob (11). Last movement of the azimuth knob should be left to right.
- 8 With the Pantel and M154 alignment device crosshairs aligned, the bubble centered in the pitch level vial (12) of the M171A1 telescope and quadrant mount, and the cannon tube at zero elevation, record the reading of the Pantel azimuth counter (13).
- 9 Remove the M154 alignment device and install a second M154 alignment device. Make sure dovetail and mating surfaces match. Turn the light switch to ON.
- 10 Repeat steps 7 and 8 with a second and third M154 alignment device.
- 11 Compare the three azimuth counter readings. If readings from the M154 alignment devices fall within ± 0.5 mil of each other, the M154 alignment devices are serviceable. Any M154 alignment device that exceeds the ± 0.5 mil tolerance is defective. SC, boresights Pantel using DAP (Para 2-33). If alignment problem persists, notify unit maintenance.
- 12 Remove and store the M154 alignment device.
- 13 M154 alignment device comparison test is complete.



TDC0254

Section X. DFCS USER CONFIDENCE CHECKS

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3-22 PURPOSE

a. For the M777E1 howitzer, user confidence checks provide assurance that the azimuth output by PNS is within +/-2 mils of grid azimuth. If this limit is exceeded, notify unit maintenance.

b. SC can check the position and direction data shown by the CSD. Some PNS user confidence checks can be executed with minimum workload increase on the SC and his section, and minimum interference with the section's response to fire missions and move orders.

c. These procedures augment the DFCS BIT, as BIT alone does not fully assure that the DFCS accuracy is within tolerance. The installation and boresight angle entry procedures of the PNS are beyond the scope of the howitzer section.

3-23 VERIFICATION OF DIRECTION USING A DISTANT AIMING POINT (DAP)

a. This procedure provides an independent method of verifying the lay of the DFCS. If surveyed azimuth data is not available, you can check the DFCS and the Pantel for a match in deflection and quadrant elevation.

b. This test can be performed at a Firing Point or Fire Area. To perform this test, a DAP at least 1500 meters away is needed.

- 1 Traverse the cannon tube until ACTL DEFL displays 3200 deflections on the CSD (SECTION IN ORDER) screen (this is the center of sector or base azimuth).
- 2 Check boresight of Pantel with the M154 alignment device.
- 3 Select a DAP that is at least 1500 meters away.
- 4 Using the azimuth knob, align the vertical hairline of the Pantel on the DAP. Level the pitch and cross level bubbles and check alignment.
- 5 Engage the deflection knob, set the deflection counter at 3200.
- 6 Using a breech boresight disk and muzzle crosshairs, align the tube on the DAP.
- 7 Level the pitch and cross level bubbles on Pantel mount. Using the azimuth knob, align the vertical hairline of Pantel on the DAP. Record the Pantel deflection reading from the reset counter.

NOTE

The azimuth counter must read 3200.

- 8 Center the elevation level vial on M171A1 telescope and quadrant mount. Record the M17A1 fire control quadrant reading.
- 9 Read and record the ACTL deflection (DEFL) and QE obtained on the screen.

- 10 Compare deflections and quadrants obtained in steps 7, 8, and 9. The tolerance between readings is +/- 2 mils for both deflection and quadrant.
- 11 If the DFCS and Pantel agree within the tolerance, the test is complete.
- 12 If the DFCS and Pantel do not agree within the tolerance, notify unit maintenance.

3-24 VERIFICATION OF DIRECTION USING AIMING CIRCLE ORIENTED TO GRID AZIMUTH

- a. This procedure provides an independent method of verifying the lay and boresight of the DFCS when a survey control point is not available.
- b. If surveyed data is not available and hasty survey is not possible, the next best method of orienting the aiming circle is to use the magnetic needle (See FM 6-50, Chapter 4 for orienting the M1A2 aiming circle).
- c. Both the DFCS and Pantel can be checked for boresight alignment using an M1A2 aiming circle set up using the Grid Azimuth method.
- d. This test can be performed at a firing point or fire area.

DFCS Boresight Alignment Check

- 1 Set up M1A2 aiming circle 10 to 15 meters in front of cannon tube (See FM 6-50, Chapter 4 for orienting the M1A2 aiming circle).
- 2 Check boresight of the Pantel with the M154 alignment device.
- 3 Install muzzle crosshairs and breech disk.
- 4 Traverse and elevate cannon tube until the aiming circle operator can see his reticle, muzzle crosshairs, and breech disk lined up.
- 5 Measure the QE by placing gunner's quadrant on the breech seats.
- 6 If the azimuth of the M1A2 aiming circle and the output from the CSD is within +/- 2 mils, and the QE from the gunner's quadrant within +/- 1 mil, DFCS boresight alignment is complete.
- 7 If the azimuth is +/- 2 mils or +/- 1 mil in elevation, perform an orderly shutdown of the DFCS (Para 2-39b.), then initialize DFCS (Para 2-39a.) and repeat steps 1 through 5 two additional times. If azimuth is within 2 mils and 1 mil QE on two consecutive attempts the alignment is complete.
- 8 If DFCS boresight alignment check is greater than +/- 2 mils for azimuth and greater than +/- 1 mil for QE, notify unit maintenance.

Pantel Boresight Alignment Verification.

- 1 Ensure steps 1 and 4 above has been performed.
- 2 Using the azimuth knob, align the vertical hairline of the Pantel on the M1A2 aiming circle.
- 3 The aiming circle operator resets the upper motion to 3200. Then realign his reticle on the muzzle brake crosshairs and breech boresight disk using the lower motion.
- 4 If the deflection reading from the Pantel is 2 mils greater than the reading from the aiming circle, the Pantel is out of tolerance and FCAT must be performed.

3-25 VERIFICATION OF DIRECTION USING AN AIMING CIRCLE OS/EOL

- a. This procedure provides an independent method of verifying the lay and boresight of the DFCS. It requires access to an M1A2 aiming circle and survey data.
- b. If survey data is available, the best method of orienting the M1A2 aiming circle is to use the Orienting Angle method. You can check both the DFCS and Pantel for boresight alignment using an M1A2 aiming circle set up using the orienting angle method.
- c. This test can be performed at a fire point or fire area.

DFCS Boresight Alignment Check.

- 1 Set up M1A2 aiming circle 10 to 15 meters in front of cannon tube (See FM 6-50, Chapter 4 for orienting the M1A2 aiming circle).
- 2 Check boresight of the Pantel with the M154 alignment device.
- 3 Install muzzle crosshairs and breech disk.
- 4 Traverse and elevate the cannon tube so that the aiming circle operator can see his reticle, muzzle crosshairs, and breech disk lined up.
- 5 Measure the QE by placing a gunner's quadrant on the breech seats.
- 6 If the azimuth of the M1A2 aiming circle and the output from the CSD is within +/- 2 mils, and the QE from the gunner's quadrant within +/- 1 mil, DFCS boresight alignment is complete.
- 7 If the azimuth is +/- 2 mils or +/- 1 mil in elevation, perform an orderly shutdown of the DFCS (Para 2-39b.), then initialize the DFCS (Para 2-39a.) and repeat steps 1 through 5 two additional times. If azimuth is within 2 mils and 1 mil QE on two consecutive attempts the alignment is complete.
- 8 If DFCS boresight alignment check is greater than +/- 2 mils for azimuth and greater than +/- 1 mil for QE, notify unit maintenance.

Pantel Boresight Alignment Verification.

- 1 Ensure steps 1 and 4 above have been performed.
- 2 Using the azimuth knob, align the vertical hairline of the Pantel on the M1A2 aiming circle.
- 3 The aiming circle operator resets the upper motion to 3200. Then realign his reticle on the muzzle strings and breech disk using the lower motion.
- 4 If the deflection reading from the Pantel is +/- 2 mils than the reading from the M1A2 aiming circle, the Pantel is out of tolerance and FCAT must be performed.

3-26 TESTING THE ACCURACY OF THE DFCS ELEVATION

- a. This procedure provides an independent method of verifying QE of the DFCS. Check the DFCS and the gunner's quadrant for a match in QE.
- b. Before performing this test, ensure the cannon assembly is properly equilibrated to prevent tube elevation drift.
- c. This test can be performed at a Firing Point or Fire Area.

- 1 Level the cannon tube using a pretested gunner's quadrant.
- 2 Read and record ACTL QE on the CSD screen. Gunners quadrant and ACTL QE displayed on the CSD should be +/- 1 mil tolerance.
- 3 If ACTL QE is outside tolerance, notify unit maintenance.
- 4 Set the scale on the gunners quadrant to 100 mils (applied gunners quadrant correction).
- 5 Place the gunners quadrant on the breech seats. Elevate the cannon tube until the bubble is centered.
- 6 Read and record ACTL QE on the CSD screen. Compare the reading with gunners quadrant. Readings They should agree to within +/- 1 mils.
- 7 Repeat steps 4 through 6, adding 300 mils elevation each time, until maximum elevation is reached. Then decrease elevation in 300 mil increments and repeat measurements.
- 8 Compare all differences to the tolerance of +/- 1 mils. If the reading at any elevation exceeds the tolerance, notify unit maintenance.

3-27 VERIFICATION OF WALKOFF USING M172A1 TELESCOPE AND QUADRANT MOUNT PADS

- a. This test is performed at the same time as the OFC walk off is tested.
- b. As part of the OFC checks the howitzer has been set onto level trunnions as measured by a gunners quadrant against the M172A1 telescope and quadrant mount cant pads.
 - 1 Elevate the cannon tube through the range 0 to 1275 mil QE.
 - 2 Every 200 mil record the PNS azimuth on the CSD screen.
 - 3 If the recorded azimuth is +/- 3 mils from the starting (0 mil QE) azimuth the system has failed to meet tolerance, notify unit maintenance.

3-28 VERIFICATION OF POSITION USING SURVEY POINTS

To perform the position test, two carefully surveyed points about 3-4 km apart are required, with an accuracy of 1:1000 or better.

- 1 Initialize the DFCS (Para 2-39a.) with the howitzer left wheel within one meter of the first survey control point. Ensure easting, northing, altitude match the data posted on the survey marker.
- 2 Receive a manual move order from the FDC (destination INIT POINT) to the second survey point.
- 3 Move to the second survey point without stopping.
- 4 Upon arrival at the survey control point, position howitzer with the left wheel within one meter of survey point.
- 5 With the STEER TO screen displayed, read and record DFCS position data under POSN (Easting, northing, altitude) and the range to destination (RNG) in the upper right hand corner of the screen. Subtract the POSN altitude from the DESTN altitude.

3-28 VERIFICATION OF POSITION USING SURVEY POINTS (cont)

- 6** Compare the data obtained in step 5 with the following tolerances:
 - (a)** Range 26 meters or less.
 - (b)** Altitude difference +/- 26 meters.
- 7** If the DFCS data is within tolerance, but the POSN easting, northing, and altitude do not match the survey marker data, then conduct a NAV POSN UPDATE.
- 8** If DFCS data is within tolerance, position test is complete.
- 9** If the DFCS data is out of tolerance verify the DESN easting, northing, altitude matches the data on the survey marker. If they do not match, record the survey marker data for later use.
- 10** Press ARRIVED key. Select NAV POSN UPDATE from the SETUP and INFORMATION menu to enter the survey marker data. Do a NAV POSN UPDATE by pressing the USE ALL key.
- 11** Receive a manual move order to the first survey point.
- 12** Move to the first survey point without stopping.
- 13** Repeat steps 4 through 6 at the first survey point. Record the data and note whether the DFCS is within tolerance.
- 14** Press ARRIVED key. Select NAV update from the SETUP and INFORMATION menu to enter the survey marker data. Do a NAV position update by pressing the USE ALL key.

NOTE

If a surveyed azimuth to a DAP will be used for a direction test at the second survey point, then the manual move order entered should include the azimuth to DAP. When entering the manual move order, first enter the azimuth to DAP as the azimuth of fire, then by positioning howitzer at second survey point with vehicle heading aligned with center of sector, you will ensure the cannon tube is pointing toward the DAP.

- 15** Receive a manual move order from the FDC to the second survey point.
- 16** Move to the second survey point without stopping.
- 17** Repeat steps 4 through 6 at the second survey point. Record the data and note whether the DFCS is out of tolerance.
- 18** If the DFCS was out of tolerance two out of three trials, notify unit maintenance.
- 19** If the DFCS was in tolerance two out of three trials, press ARRIVED key. Select NAV UPDATE from the SETUP and INFORMATION menu and enter the second survey marker data. Do a NAV POSN UPDATE by pressing USE ALL key. Proceed to the chosen method for testing direction.